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OPHTHALMIC INJURIES IN WAR*

BY

N. I. SHIMKIN

HAIFA

THE present war has taken on the character of trench warfare. The experience of the World War showed that on the Western Front eye injuries increased two and even three times during the period of trench warfare in comparison with the preceding period of open warfare (Darier).

Trench warfare consists mainly of artillery activity which, directed against fortifications, inflicts not only wounds through fragments of bomb, shell and shrapnel, but also by innumerable splinters of stones, cement and sand. These splinters, " indirect projectiles," accompany every explosion and, thanks to their having acquired great speed, cause injury to the globe of the eye no less dangerous than that of the shell fragments. But, according to my own observations, the most destructive agents of the visual organ are rifle and machine gun bullets which cause mainly transpiercing wounds of the head, orbit and of the eye itself.

These observations were made at the Chief Casualty Clearing Station on the Russian South-Western Front during 1914 and 1915, and from 1916 as consulting ophthalmologist to the Army

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on the same Front. I had the opportunity of observing and studying every variety of ophthalmic injury from the day of injury, and later followed cases through until the Special Medical Board finally decided whether the patients were fit or not for further service in the army. The early cases numbered 238, while 593 cases of eye injuries were treated at the hospitals in the rear and are termed " late cases." Study of late cases showed that each eye patient occupied a bed, on an average, during 46·8 days. Out of 100 wounded there were 2·25 cases of eye injuries; out of 100 head injuries, 20·4 per cent.—very similar to the figures given by Oguchi for Japanese casualties in the Russo-Japanese war. The figure of percentage relation of eye wounds to head wounds refers with certainty only to those cases which reached the Chief Casualty Clearing Station and the rear Hospitals, as the penetrating through and through gunshot wounds, eye—brain, in the great majority of cases were mortal and did not reach the Hospital.

There has been little if any change in the nature of gunshot wounds since the Great War, and so some more detailed description of the injuries incurred and their end results may be of service to medical officers in this war. The results of my clinical and statistical studies have been published in a whole series of articles in different Russian medical and ophthalmological magazines. But the aim of the present article is to point out those cases of fire-arm injuries of the visual organ, the therapy, diagnosis and prognosis of which can present difficulties to many surgeons during the first weeks of their war practice, as was experienced by myself.

Out of many similar cases two cases of cortical blindness might be mentioned, one of which was caused by a rifle bullet which pierced the occipital bone somewhat lower than the apex of the lambdoidal suture. This case was accompanied by injury to the brain tissue of this region. In the second case there was a concussion of the occipital region due to the explosion of a heavy artillery shell.

First case (Fig. 1). The patient, Trooper K.A., aged 32 years, arrived at the Chief Casualty Clearing Station 22 hours after being wounded. He stated that he felt he was wounded in the head on the previous day and lost consciousness. When he came to himself again he noticed that he did not see anything, though he felt that the lids were open. The patient coherently answered the questions put to him. Eye examination: lids, eye-ball movement and external membranes of the globe were normal. All pupillary reactions—normal; Fundus oculi—normal. Vision: R.E.=L.E.:—perception of light directed straight into the eye. In the periphery of the retina the patient had no perception of light. He complained of headache and blindness. On examining the

patient's wounds on the occipital bone it appeared that the wounds of entry and exit were almost alike in size and were located at a distance of 6 centimetres from each other on either side of the middle line in the occipital region. Brain substance was flowing out of both wounds, but there was no other pathological finding. During the first examination the patient lost consciousness several times and his pupils were fully dilated. The diagnosis was obvious: any oculist would have no difficulty in diagnosing cortical amaurosis due to wound in the occipital region, but the prognosis was established only during hospital treatment. After proper toilet of the wound and the removal of bone splinters, a sterile dressing was applied and an ice-bag was placed on the occipital region of the head. On the next morning (two days after being wounded) the patient could distinguish hand movements. Temperature normal. On the second day the vision = 0·5 in both eyes. During the dressing a small quantity of oily, viscous material was discharged from the wound. The patient vividly described the details of the battle in which he was wounded. On the fourth day his vision was 6/6. The field of vision for white, red and green colours was normal. The fundus oculi was normal. Temperature normal. On the fifth day the patient was evacuated to the rear.

The *second case* of cortical blindness was caused by concussion of the occipital region following the explosion of a heavy shell without any visible injury to the occipital bone. Trooper K.K., aged 24 years, stated coherently that 8 days previously, he was wounded in the head during a shell explosion in the trench; the trench was destroyed and he himself buried by earth. He came to himself when he was being driven in an ambulance wagon, and the first thing which he felt was that he had become blind in both eyes. He complained of severe pain in the head which, according to his words, was shot through in the region of the neck. On examining the skull on both sides of the occipital protuberance there were slight skin scratches. When palpated, the skull bones appeared to be intact. (There was no X-ray apparatus at the Station.) Besides blindness there were no other changes in the somatic and psychic spheres. During the examination of the vision the following was noticed: the pupillary reactions to direct light and the consensual reactions were very sluggish; on attempting convergence the left eye showed external deviation. Vision R.E.—light perception, L.E.—movement of hand before the eye in the nasal half of the field of vision. Ophthalmoscopic examination: the margins of the optic disc of the right and left eyes were slightly swollen, the veins of the disc somewhat widened in the left eye and even tortuous in the right eye. Treatment: rest and ice-bag on the head. On the eighth

day of the patient's stay in the hospital the improvement observed was very slight. In R.E., hyperaemia of the optic disc was more pronounced than in L.E. Vision R.E.=counting fingers from the distance of 2 metres in the temporal side of the field of vision; L.E.=2 metres also in the nasal side.

In view of urgent need to evacuate wounded, the patient was sent to Kiev with the diagnosis: Cortical amaurosis, right hemianopia and intra-cranial haemorrhage in the occipital region of the head due to concussion. The later history of the case is that five weeks afterwards the patient was found unfit for further service by the Medical Board, the cause being the right sided hemianopia and the deficient vision: viz., counting of fingers at the distance of 2 metres in the seeing part of the retina of both eyes.

These two cases may serve as examples of the fact that the prognosis regarding the degree of loss of vision resulting from injuries of the cortical visual centre should be very careful: the vision sometimes remains unimpaired when the brain substance of the visual cortex is lost; while the concussion of the occipital bone (the skull being intact) can produce an intra-cranial haemorrhage with a moderate papilloedema and also disturbances of the visual cortex resulting in hemianopia of different grades and various central and paracentral scotomata with great loss of vision.

Similar cases of cortical blindness after wounding and concussion as well as injuries of the visual path were observed at all fronts, and were described by a whole series of English, French and German surgeons. (Lister, Gordon Holmes, Hine, Jessop, Pierre Marie and Charles Chatellin, Uhthoff and others.)

But at the Chief Casualty Clearing Station it is necessary to decide quickly and differentiate between injuries and concussions of the cortical visual centre on one hand and the multitudinous cases of hysterical blindness due to severe traumatic neurosis with loss of vision on the other.

The differential diagnosis between these two morbid syndromes of blindness consists in that the patients suffering from cortical blindness due to injury walk bravely supported by their comrades, talk willingly and show no signs of psychic disturbance, while "the blind" suffering from a form of a severe traumatic neurosis have a peculiar posture distinguishing them from hundreds of other wounded. These patients supported by their comrades walk heavily leaning on a stick, walk carefully as if afraid of losing their balance; the expression of their faces is gloomy, unsatisfied and as though frozen; the gaze is purposelessly fixed staring forward; the movements are slow and languid, the voice is monotonous; the answers are monosyllabic and slow. It seems

as if the patient hears the words addressed to him indistinctly, forms an answer with difficulty, stammers often and sighs. Usually in the history we found that the patient had been wounded by the explosion of a heavy shell, or had fallen on his back during the explosion. With such patients, besides well known hysterical eye symptoms (such as marked concentric contraction of the field of vision for all colours, proptosis, miosis, nystagmus and so on) may also occur diplopia and monocular polyopia, accompanied sometimes by micro-megalopsia et macropsia.

These cases were discovered by the author in the following way: when patients alighted from a hospital train, I inquired of each soldier with a bandage round his head about the condition of his sight, and invited him to count the fingers at the distance of one metre with each eye separately. Showing one finger I asked "How many fingers?" A patient with monocular diplopia or polyopia would answer slowly, as if hesitating, "two" or "many." When ordered in the dressing room, in the presence of other doctors and nurses, to take hold of the right finger, the patient would extend his arm and take the false image seen by him at the right side of the real position of the finger. Not feeling the finger in his hand the patient became disconcerted and perturbed and said confusedly, "no, there's nothing!" On endeavouring to take hold of another finger on the other side the same mistake was repeated. Then the patient, visibly agitated and perspiring all over, started moving his hand from one false image to the other, and coming across the real finger shown took hold of it and firmly gripped it, as if desiring to make sure that he had taken hold of the object seen by him. Such patients were not left at the Chief Casualty Clearing Station, but were immediately sent to hospitals in the far rear of the country.

But at the Chief Casualty Clearing Station the oculist sees chiefly gun-shot injuries of the orbit and its contents. Out of 287 cases of injuries to the eye ball it appeared that together with orbital injuries there were 163 cases of eye-ball wounds, *i.e.*, 56·4 per cent., and 124 cases without orbital injury, *i.e.*, 43·6 per cent. From these figures it follows that the orbit not only does not protect the eye-ball from destruction, but also contributes to the destruction of the integrity of the eye-ball by fragments of orbital bones.

On the Russian Front, at the beginning of the war, artillery battles did not attain such an intensity as on the Western Front. Therefore, in my statistics rifle-bullet wounds of the orbit and its contents predominate. But of the above 163 cases of injuries 109 or 60·7 per cent. were inflicted by a rifle-bullet, and 54 or 39·3 per cent. by artillery shells. It is necessary to point out that the rifle bullets give predominantly a through and through penetrating

wound of the orbit (79·8 per cent.), while the artillery shell fragments give piercing wounds of the orbit amounting to 21 per cent. of orbital injuries. The rifle bullets inflict nearly three times more through and through penetrating wounds of both orbits (19 cases), than the artillery fire (7 cases).

When diagnosing the character and extent of the orbital injury the surgeon should take into consideration that its cavity is filled with a semifluid mass—orbital fat on which the eye rests; the muscle tissues are also rich with fluid. The rifle bullet passing behind the eye-ball transmits its energy to the fluid which, thanks to its incompressibility, presents an ideal medium for the transmission of the energy conveyed. The kinetic energy of the Russian bullet at the moment of its exit from the gun-barrel was 303-402·5 kilogramme-metres. Certainly the modern fire arm agents and bullets have bigger velocity and bigger mass than before. Therefore, their destructive action must be also bigger.

The bullet having penetrated the orbit acts by its force not only along the line of its path, but develops immediately hydrodynamic forces in the fluid contents of the orbit, and these forces act in all directions perpendicular to its path. (Explosive effect of the bullet.) These forces strike also the posterior pole of the eye-ball and the same impact will be sustained by all the walls of the orbit. On applying a force of great momentum to an elastic body, in this case to the eye-ball, the latter either will change its form, *i.e.*, there will appear different ruptures of the eye-ball itself or of its internal membranes (choroid and retina) or it will change its position, *i.e.*, the eye ball will move in the direction of the action of the energy, in our cases—towards the aperture out of the orbit; which gives a clinical picture of protusion, luxation, or avulsion of the globe and orbital contents. Such cases are described below and illustrated by Figs. 2, 3, 4, 4*a* and 4*b*.

Trooper K.C. was wounded by a rifle bullet on November 28, 1915. The diagnosis was a gunshot wound of the temporal bone and left frontal bone. Ectopia of right orbital contents and counter-rupture of the sclera of the left eye. The wound of entry was 6 cm. outside from the outer margin of the ligamentum externum of the right eye-lids; the wound of exit was 2 cm. beyond the left eye-brow (Fig. 2). Out of the right palpebral fissure a formless fleshy mass covered with coagulated blood protruded; under this bloody clot stretched—like a finger of a glove turned inside out—the periorbita, attached at the orbital margins by a compact fascia periorbitalis. In other words, it was a case of traumatic autoexenteration of the orbit.

After excision of the expelled periorbita (under chloroform anaesthesia) it appeared that the external and internal walls of the

TABLE I

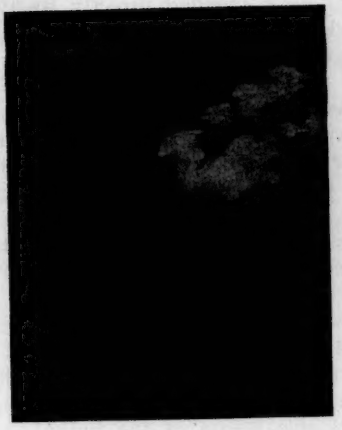

FIG. 1.

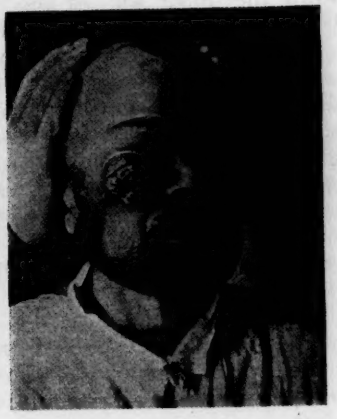

FIG. 2.

FIG. 3.

right orbit had been destroyed only along the path of the bullet, while the upper wall of the orbit (not touched directly by the bullet) was destroyed utterly and broken into tiny splinters which were forced in a great quantity into the periorbital tissue pushed outside. At the upper wall of the orbit there were big bone defects through which prolapsed brain tissue. The microscopic examination of the mass expelled (Fig. 3) failed to discover either the eye-ball membranes, or the optic nerve, the mass consisted only of periorbital tissue with the rest of the periorbital fat cells and other orbital tissue, and of bone fragments forced into it. In drawing 3, which shows a horizontal section of the mass, bone fragments are marked by 1; necrotic tissue—by 2; blood clot—by 3.

The process of the expulsion of the orbital contents and absence of the eye-ball may be explained in the following manner: the bullet, when passing from the right side to the left, broke the orbital pyramid at its apex and cut the optic nerve; then owing to the hydrodynamic forces (explosive action of the bullet) the globe together with the periorbita was dislocated outside into the rima palpebrarum, *i.e.*, in the direction perpendicular to the passage of the bullet. It is important to note that the upper wall of the orbit was also broken by the same explosive action of the bullet in the direction perpendicular to its path, the perpendicular force acting both upwards and downwards. Besides being pushed forward from behind by the explosive action of the bullet the periorbita was also expelled by the subsequent strong haemorrhage and turned inside out, as a glove finger turns wrong side out when being pulled off the hand; the eye-ball having no firm connection, freed from its attachment to the external eye by muscles to the Annulus Zinii, simply rolled out of the orbital contents. For the complete understanding of this case it is necessary to add that on investigating the left eye-ball there was found in the lower inner quadrant of the sclerotic, near its corneal margin and parallel to it, an inferior rupture of the sclerotic with prolapse of the iris and ciliary body. In other words, although the wound of exit was lying in the frontal bone over the left eyebrow, " the explosive action " of the bullet spread perpendicularly to its path, pressed the eye-globe from the top downwards, wherefore by contrecoup occurred the inferior corneo-scleral rupture.

Under chloroform anaesthesia the tissues near the orbital margin were cut off by means of scissors. Bone fragments were removed from the orbit, and the orbit was filled with sterile gauze. On the second and third days after the operation the temperature rose to 38° C., but then did not rise higher than 37·2° C. On the tenth day the invalid felt so well that he walked to the Hospital train supported by one man.

TABLE II

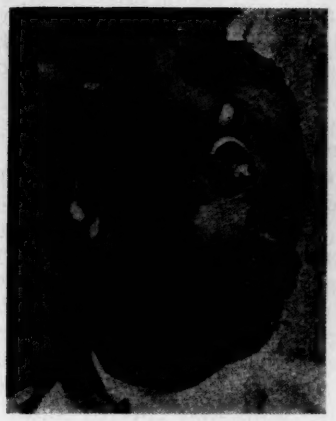

FIG. 4.

FIG. 5.

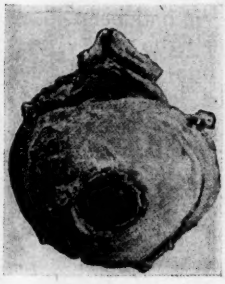

FIG. 4*a*.

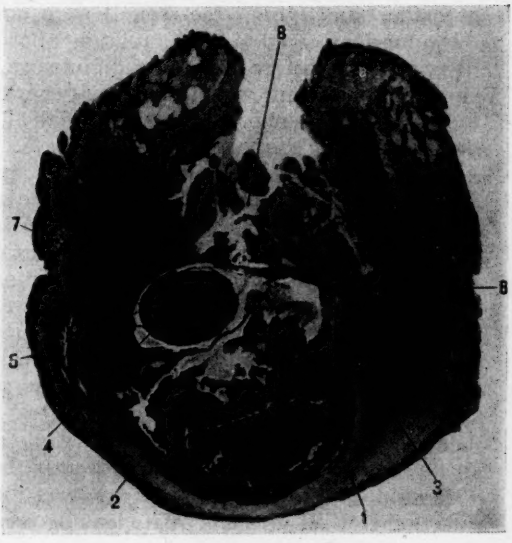

FIG. 4*b*.

Second case: W.B., aged 26 years, wounded by a rifle bullet. *Diagnosis*: Gun-shot wound of temporal bone on each side, with luxation of the globe and evulsion of the optic nerve on the right side and rupture of the left globe by contrecoup (Figs. 4, 4*a* and 4*b*).

In Fig. 4 the point of entry was lying 4 cm. external to the outer corner of the right eye, that of the exit—at the external angle of the upper lid of the left eye. On examination *the right eye* appeared to be luxated outside. It was held only where the conjunctiva was fastened to the tarsus of the upper and lower lid. The cornea was not perforated but black. The left eye was decreased in its dimensions. The cornea was gray, not transparent, there was no anterior chamber, the eye-ball was soft.

An operation was performed on the right eye: under chloroform anaesthesia the conjunctiva was cut by means of scissors along the circumference one centimetre from the upper tarsal margin. The conjunctiva was densely adherent by scar tissue to the underlying tissue. When this scar tissue was being cut by means of scissors, crackling was heard due to its density. When the conjunctiva was cut away the globe fell off. The separated eye was photographed in a scale somewhat smaller than the actual size and shown in Fig. 4*a*. There was no optic nerve in the globe; it had been torn from it; the orbital walls were covered with the periorbital tissues, and no evident destruction of its walls was noticed. Daily bandaging, washing the wound with hydrogen peroxide, tamponning the wound were done. Three days later the wound appeared to be granulating; headaches which had been insupportable before had now diminished, consciousness which early had been dull was now clear; general well being was satisfactory. The temperature was normal all the time. The next day the patient was evacuated to the base.

Fig. 4*b* shows a section of the microscopic preparation magnified two and a half times. It is possible to see that the conjunctiva starting from the cornea (1, 2), covers further all the exterior part of the sclerotic which in its posterior part (3) is covered with the orbital tissues (6, 7). There is no optic nerve, it had been torn out of the globe, and in its place there remained the cavity (8), the walls of which consist of fat, cellular, and orbital tissues. The inside of the eye is filled with blood clot, the lens is luxated inside the eye-ball and lies touching the posterior pole (4*b*).

This case of luxatio bulbi is of great interest in that there is a true evulsion of the optic nerve, while it confirms the presence of the explosive action directed towards the posterior pole of the eye-ball, owing to which the eye was torn off the optic nerve like a cherry off its stem. The lens by contrecoup was dislocated into the vitreous close to the posterior pole. The whole cavity of the eye-ball was filled with blood.

The fact that the patient suffered from severe headaches and an impaired consciousness indicates trauma of the brain and the meninges, which rapidly improved by rest. No doubt, these disturbances were caused by the effect of explosive force on the bony walls of the orbit.

In 163 cases I observed in only 9 cases a penetrating wound of both temporal bones, *i.e.*, 5·6 per cent. They have been mentioned at the beginning of the article because a surgeon does not observe them in peace time, and because these cases give the possibility of appreciating the effects of the explosive action in a gun-shot wound causing much more extensive destruction than one can suppose on external examination.

The following table shows the various directions of orbital gun-shot injuries:—

			Per cent.
1.	Injuries orbito—cranial ...	68 cases	41·7
2.	,, orbito—subcranial ...	12 ,,	7·3
3.	Bilateral temporal injuries ...	9 ,,	5·6
4.	Orbito—facial injuries	74 ,,	45·4
		163 cases	100·0

This table illustrates how dangerous to life are the injuries of the orbit, as a cavity lying near the brain. To the orbito-cranial injuries I refer all the orbital injuries where the wound of entry or of exit, or both lie above the upper margin of the arcus zygomaticus, *i.e.*, where the cranial bones bordering on the anterior and middle cranial fossae may also become subjected to trauma. To the injuries orbito-subcranial I refer all the injuries where the bullet, having entered the orbit or destroyed its walls, breaks its way under the base of the brain, and comes out below the mastoid process, and at different heights of the back of the neck depending on the position of the head at the moment of injury. On the basis of above figures, one may come to the conclusion that in every two orbital injuries one will be accompanied by injury of the cranial bones, and, as a consequence, by trauma of the meninges and of the brain itself. Therefore, injuries in the orbit should be considered as cranio-cerebral ones, and appropriate care taken in treating and transporting such patients. A serious injury to the orbit causes most certainly such damage to the bulb of the eye that enucleation is necessary. The surgeon should very carefully separate the lacerated sclera from the underlying tissues in order not to inflict any additional trauma to the tissues and walls of the orbit which have already been injured by the bullet. Usually several days after the injury the lacerated sclera and particularly posteriorly is attached so densely to the underlying orbital tissues that, when cutting through them, a creaking sound is heard as if glass was being cut. In such cases it is better not to draw upwards by force the remains of the sclera on the optic nerve, but to cut them as short as possible, having cleaned them thoroughly from remains of the choroidal tissue.

It should be made a rule that the enucleation of the eye must be performed by an eye-surgeon, who is accustomed to preserve every millimetre of the conjunctiva for the formation of a conjunctival sac of a sufficient dimension for the future prosthesis.

The fear of sympathetic ophthalmitis setting in, has sometimes led to the hurried enucleation of the eye. This fear is groundless. There are no proved cases of its having set in before the seventh day after the wounding of the eye. This time is sufficient enough for sending the patient to an eye surgeon. Among 593 " late cases " the author saw only one case of sympathetic irritation on the twenty-sixth day after the injury. Among 238 " fresh cases " he met neither sympathetic irritation, nor sympathetic ophthalmitis.

As to the problem of the influence of injuries of the orbit and its contents on one side on the condition of the vision in the other eye, no change in the unaffected eye was observed among 137 cases of one-sided orbital injury.

The healing of orbito-cranial injuries under hospital treatment at a Chief Casualty Clearing Station was satisfactory enough. The abundant, often evil smelling suppuration decreased and soon discontinued under the influence of soaking gas tampons. The wounds granulated well. " Fresh " cases with destruction of brain and the meninges did not develop meningitis. The temperature which was high before and immediately after the operating and opening the wound wide, removing fragments of bones and enucleation of the damaged eye, abated after 3-4 days. Consciousness, which had been dulled, soon became clear again, and severe head-aches disappeared.

However, the prognosis for the general health, and even for the further life of the patient with orbito-cranial injuries should be made with great care. I have seen a fatal case of suppurating meningitis which set in 52 days after a penetrating wounding of both orbits. Previously the general health of the patient was good and he had been already ordered to appear before a final medical board for his discharge. One case of a tangential injury of the orbit from a rifle bullet was complicated by a cerebral abscess which developed on the twentieth day after the wounding. The end was fatal. Therefore orbito-cranial cases should be kept in hospital as long as possible, before the patients are sent home.

Orbito-facial injuries, *i.e.*, those where the wounds of entry and of exit lie below the upper margin of the arcus zygomaticus, in cases of oblique or penetrating wound of the external or lower wall of the orbit, are always accompanied by a major or minor injury of the eye-ball. In none of the 74 cases seen by me was consciousness affected, nor were there severe head-aches caused by trauma to the brain or the meninges. It is, therefore, possible

to conclude that the orbito-facial injuries, however extensive they may be, cause no trauma to the brain and the meninges.

Therefore, the classification of orbital injuries into the orbito-cranial and orbito-facial ones has both anatomical and clinical reasons. The former endanger the life of the patient while the latter, however terrible the appearance of the wound with the antrum of Highmore exposed, or the zygomatic process and evil smelling pus welling out, are not fatal, for the wounds heal well. Usually in oblique orbito-facial injuries the anterior hemisphere of the globe with the choroid attached is ruptured. Pieces of the choroid may partly adhere to the tissues of the orbit. In such cases enucleation or exenteration of the eye should be postponed until the suppuration from the wound stops, and then the patient should be sent to the base to a suitable hospital for an osteoplastic operation.

As to the character of wounding of the eye-ball without injury to the orbit, the wound was inflicted by artillery fire and bombs in 59 cases (47·5 per cent.), and by gun-shots in 39 cases (31·5 per cent.). The remaining cases refer to the category of casual wounds: the patient had met with a bayonet, ran against a tree branch in the night, fell or was knocked against a stone and so on. In 59 cases eye-ball injuries were accompanied by a prolapse of the iris; in 23 cases this prolapse was aggravated by traumatic cataract. In 28 cases iridocyclitis was observed; in 15 cases there was complete destruction of the eye, in 17 cases there was panophthalmitis of both eyes, which in four occurred simultaneously. Such severe injuries are also observed in peace time and they require just the usual accepted treatment, as: cutting away of the prolapsed iris, covering the wound by conjunctival flap, removing the lens, extraction of a foreign body, exact determination by means of X-rays of the location of the foreign body, applying the magnet and so on. But during the war the final results of all the perforating injuries were bad. In " fresh " cases met with by the author the eye preserved a slight vision in 15 per cent. cases. In " late " cases seen at Eye-Clinics of Kiev University the vision was preserved only in 8·2 per cent. cases. Early operation is likely to preserve the sight in twice as many cases as in late cases. The cause of such a high percentage of cases losing their sight is due to the " indirect projectiles." The tiniest splinters, on account of their enormous kinetic energy, tear through the cornea and the sclera. These splinters consist of the tiniest particles of stone, sand, cement and any kind of dirt or mud blown up by the explosion of shell or bomb. These particles are so small that after enucleation of the eye it is impossible to perceive them with the naked eye, or to palpate them in the retina and the choroid between the fingers. It is

possible that eye-shields (Cruise) would prove a partial protection against these splinters during the explosion of bombs and grenades. There were no such protective shields in the Russian army, and I have had no experience of their use. The destructiveness of these splinters may be illustrated by the following case (Fig. No. 5):

Trooper W.N. was wounded during the explosion of a heavy shell near trenches. The shell blew upwards. The patient saw that it exploded not far from him and felt immediately as if his eyes were burnt and that something had knocked against his arm. Eight days after, the patient was brought to the Chief Casualty Clearing Station. The face was covered by tiny excoriations and scratches. On the part of the *eyes*: perforated wounds and panophthalmitis. R.E.: Scleral rupture and prolapse of vitreous. L.E.: Corneal wound and suppuration. Protrusion of the globe. (Fig. 5.) Such extensive and destructive injuries to the eyes are not observed in peace time. This case is of interest also, because it shows clearly how much more complicated becomes the comparatively simple operation of enucleation under war conditions. Owing to violent pain in the left eye, it was decided to enucleate it. But on operating, the conjunctiva was separated with difficulty on account of adhesion to the sclera. All the extrinsic eye-muscles had adhered so densely to the underlying tissues that the hook for tenotomy could not be introduced, and it proved impossible to draw upwards any of them: the hook met everywhere with sclerotic connective tissue. Instead of the classic enucleation, exenteration had to be performed at first, and then the sclera was separated from the underlying tissue with great caution. The sclera was cut off from the optic nerve in such a way that a small part of sclera remained adherent to the nerve. The patient was fit enough to be evacuated after four days.

Among 238 " fresh " cases the eye was enucleated in 33 cases, *i.e.*, in 13·8 per cent., but among " late " cases consisting of 593 casualties the eye was enucleated in 218 cases, which constitutes 37·5 per cent. In other words, however strong the desire for preserving the eye in late cases was, the surgeon had to enucleate the eye three times more often than in " fresh " cases, in order to avoid the danger of sympathetic ophthalmitis.

Concussion of the globe.—However, loss of sight in war occurs not only on destruction of the exterior membranes of the globe (corneo-scleral rupture, and laceration of the bulb), but also when its exterior form is preserved intact. Such disturbance of vision is due to concussion of the eye. But the physical laws at work in both types of injuries are the same.

Although the force exerted at the point of impact may be great, it is applied to the eye-ball not at the posterior pole (the

results of which have already been mentioned above), but at some other side (upper, lower, outward) and the bony wall of the orbit prevents the dislocation of the eye-ball, as a whole. In this case dislocation of the part takes place, since dislocation of the whole is impossible. The tissues of the eye-ball are separated from each other. The tissues of the eye are stretched even until they rupture.

The limit of the stretching of any tissue is dependent on its elasticity. The more elastic the tissue, the greater is the limit of its stretching and vice versa. Daily experience teaches us that with reference to trauma the vascular system of our body is the least elastic. A momentary blow, even of moderate force applied to the skin of the arm, causing no damage to the integrity of the epidermis, will cause disturbance of the vascular system at the point of impact resulting in a subcutaneous haemorrhage of varying degree. If the blow is not so strong, however, as to cause disturbance of the integrity of the vascular system, then first spastic phenomena appear, and later paralysis of the vascular system follows. The skin grows temporarily pale and then reddens with swelling at the site of trauma. This swelling is the result of the transudation through the vascular walls; this transudate accumulates in the surrounding tissues both in its intercellular space and in the cells themselves; in other words, slight trauma to the vascular system causes that pathological condition which we call oedema.

Of the three ocular membranes—tunica fibrosa, tunica vasculosa and tunica nervosa—the least elastic and fragile is the tunica vasculosa and then the tunica nervosa with its own net of arteries and veins in the retina. Every kind of concussion of the eye-ball expresses itself first of all by the damage to its vascular system. It is possible to establish as a rule that the severity of concussion of the fundus oculi is in direct proportion to the disturbance of the vascular system of the two tunics: vascular and nervous. As will be shown below, the degree of cerebral concussion is determined by the extent to which the vascular system of the brain and meninges is disturbed.

The oculist has an advantage, while studying the mechanism of concussion of the eye-ball, over the physician studying that of brain. The former can observe ophthalmoscopically all the changes of the retina; whereas the changes of the "cortical retina" (area striata—pars occipitalis cerebri) are not accessible for direct observation. So also the changes in other parts of the brain causing the clinical symptoms of concussion are inaccessible to direct observation.

The ophthalmoscopic picture of a slight concussion of the retina is expressed by the aspect of a milky white cloudiness of the

retina in the posterior pole of the globe and particularly in the region of the macula lutea which is nourished by the underlying choroid.

A whole series of authors on examining the substance of this cloudiness came to the conclusion that it was the result of transudation from paralysed, dilated vessels, and the milk-white colour was due to an optical reflex. Such a white reflex may be obtained by pulverizing some transparent glass in a mortar; the powder will be seen as white while every glass particle is transparent; the cause of the apparent white colour is that among the grains of glass with their own index of refraction there is air, a substance which has another index of refraction. The two different reflexes of the two different substances give us a strong reflexion of light which we see as a milky white colour of the oedematous retina. Usually this milky white cloudiness of the retina is the result of slight trauma and disappears in 6-8 days, as soon as the blood circulation is restored. But during war, trauma is inflicted on the eyes by elements of enormous kinetic energy. A part of the vessels, both in the retina and in the choroid, is severely damaged giving haemorrhage of different degree in these membranes and into the vitreous; simultaneously, a part of the vessels is paralysed by the instantaneous blow. Ophthalmoscopically in such cases we can observe the oedema, haemorrhage and rupture of the retina (hole at the macula), and haemorrhage and rupture of the tunica vasculosa (rupture and haemorrhage of the iris, ciliary body and choroid). Groups of colloidal molecules of the transudate accumulate in the transparent tissue of the retina, and we observe various glistening white areas of the injured retina, dependent on the varying concentration and duration of its oedema. Long standing disturbances of the vascular system of the globe of the eye lead to lasting disturbances of nourishment of the tender tissue of the retina, as a result of which different degenerative changes of its epithelial elements (vacuolisation, fat-degeneration, necrosis, etc.) set in. These necrotic cells are often covered by the increased proliferation of the injured layers of pigmented epithelium of the retina and by an accumulation of connective pigment cells of the choroid after the destruction of its lamina vitrea. The fibrinous transudate organises quickly both in the choroid itself, in the retina and in the vitreous as well, and we observe connective tissue of white greyish colour along the retina and in the vitreous; in other words, we have the ophthalmoscopic picture of traumatic retinochoroiditis. As soon as the blood circulation is restored, the oedema disappears and the retina renews its visual function.

But with gun-shot concussion of the eye, as well as of the brain the disturbance of the vascular system is always extensive, and the restoration of normal circulation is delayed for a long time.

If we take into consideration that the tunica nervosa of the eye and of the cerebral hemisphere develop out of the prosencephalon, and that the tunica fibrosa (sclera) corresponds to dura mater, while the tunica vasculosa of the eye corresponds to pia mater, and that the retina and the brain have both terminal arteries of the same system then it is possible to say in advance that the essential nature of cerebral concussions will be of the same character, as concussion of the globe of the eye. The explosive action of a bullet on the cranium will correspond to what we observe in retrobulbar wounding of the orbit. As the eyeball filled with a fluid mass is enclosed in a rigid orbit, so " the sponge like brain is enclosed within a rigid skull and possesses a certain amount of independent movement and is subjected to various degrees of pressure." (Broster.)

The highly developed cerebral and intracranial vascular system will suffer first of all from any cerebral concussion which will give rise to different degrees of oedema, haemorrhage—both intra and extradural, and in different degrees to destruction of the brain substance itself. This causes a corresponding falling off of brain function. In Case I, we have seen that the oedema of the brain in the area striata led to the failure of vision. After the restoration of the blood circulation the visual function was restored. In the second case, the extensive intracranial haemorrhage which led to a long standing interference with the nourishment of the area striata, caused a lesion of the " cortical retina " with a failure of its visual function (right sided hemianopia).

The case described below illustrates the complicated injuries to the tunica vasculosa et nervosa oculi due to blast concussion. These resulted in persistent oedema of the retina, extensive haemorrhages and ruptures of both membranes with resultant degeneration of the retina and particularly of the papillomacular bundle and the optic nerve. The indirect image of the left fundus of the patient was drawn by the author 56 hours after the concussion, and then once more three days later. (Figs. 6-7.)

History of the cases.—B.V., a volunteer, aged 15 years, was bruised by the explosion of a heavy shell. He was thrown to one side and, according to his story, two troopers who were sitting close to him were killed.

The boy, well built, was in a state of a strong psychical depression, trembled all the time, and incessantly gave involuntary sighs. The speech was slow and broken, he did not answer at once, as if deaf, but the answers given were reasonable and coherent. The face was swollen and covered with multiple ecchymoses. The skin of the face was blue with ecchymoses of the lower and upper lids of both eyes.

Diagnosis: R.E.: Subconjunctival ecchymosis. Corneal

abrasions. Traumatic cataract with subluxation of the lens. Posterior synechiae. Vision: counting fingers before the eye. L.E.: Eccentric pupil. Haemorrhage and oedema of the retina, optic disc very pale. Acute pigmentation of the left fundus of the eye. R.E. could not be examined ophthalmoscopically on account of a traumatic cataract. L.E. Fig. 6 was made 56 hours after the concussion. In the lower part of the drawing extensive haemorrhages to be seen in the retina. Among the haemorrhage there are brightly glistening dots ranging in size from a big pin head to two-three mm. in diameter. Clots of blood are interspersed among milky-white areas of the oedematous retina. The vessels are greatly enlarged in the areas of oedema and partly covered by the haemorrhages. Both internal and external to the optic disc the papillo-macular bundle and the retina are of a whitish, bright steel colour. In the oedematous retina are distinguishable enlarged tortuous vessels of irregular outline and also punctate haemorrhages.

Fig. 7 was made three days after. The white glistening dots have disappeared. In the area of the haemorrhages there are seen dense patches of pigment. The papillo-macular bundle, as well as the optic disc, are still white. Vision—movement of hand at the distance of one metre from the eye. The patient does not distinguish colours: he calls red—black; green and dark-blue—sky-blue. Five days later he was evacuated.

This case is of interest in this respect that it gives us the idea of changes in the retina due to blast concussion by a heavy shell's explosion. The examination of the patient's body and face did not reveal any important injury which was caused by the fall or by a splinter from the shell.

The livid grey face is characteristic of concussion from explosion; this colour is explained by numerous subcutaneous ecchymoses caused by the sucking action in the negative phase of the blast.

The terrific fright, the trembling of all muscles of the whole body, impaired hearing, slow speech were also characteristic symptoms of blast concussion (Parsons, Grasset). Severe disturbances of the ocular vascular system caused an acute oedema of the retina, while deep destruction of the vessels of the choroid caused disturbance of nourishment in the region of the papillo-macular bundle, which led to persistent loss of visual function of the retina. The acute pigmentation of the retina was the result of the destruction of the layers of pigmented epithelium which proliferated in the inner layers of the changed retina. The rupture of the lamina vitrea of the choroid led also to proliferation of its pigmented cells in the retina.

TABLE III

FIG. 6.

FIG. 7.

The changes in the retina due to blast concussion.

Concussions of the globe of the eye owing to tangential gun-shot injuries of the upper, exterior and lower walls of the orbit gave the same ophthalmoscopic picture in " fresh " cases, as those already described as air blast injuries (Shimkin). The youth of the patients helped greatly the restoration of blood circulation in the damaged tunica vasculosa and nervosa in the majority of cases. The retina regained its transparency and gave the possibility of observing the deep ruptures of the brittle choroid which had been previously hidden by the oedematous retina (Lagrange). The ophthalmoscopic picture of similar ruptures of the choroid is well known to any oculist, as are well known also the disturbances of the anterior part of the uvea owing to the concussion of the globe (hyphaema, iridorexis, iridodialysis, subluxation and luxation of the lens, traumatic cataract, etc.) described in all textbooks on ophthalmology. But the peculiar interest of the concussio bulbi in war time is the severe disturbance of the vascular system of the eye to a degree far beyond what is observed in peace time.

The 1,000 lbs. bomb or shell will produce in this war even more terrible results and the destruction of the vascular system of the retina and the cortical visual centre and the brain itself will be met with still more often than in the last war.

In the World War, at the Russian South-Western front, among 100 ophthalmic injuries 77 men became blind in one eye (the right or the left), and there were 11·3 per cent. of blindness in both eyes.

The present war will give us probably an even higher percentage of traumatic blindness. Such a picture is terrible to contemplate, and we must all hope that the cause of such suffering may soon cease.

Summary

1. The author gives the results of his observations of 238 cases of eye injuries at the Chief Casualty Clearing Station and over 593 cases in base hospitals. He illustrates some of them by histories of the injuries, photos and drawings of those cases of eye injuries which are not met in peace time. He discusses difficulties in diagnosis, treatment and prognosis for the sake of those oculists who did not take part in the last World War.

2. He examines the character of the explosive action of bullets or other gun-shot missiles in wounding the orbit and stresses the enormous kinetic energy developed. He points out that the real destruction of the orbit and its contents is much more extensive than what is observed on examination of the external wound. All orbital wounds, where the missile passes over the arcus zygomaticus should be considered as cranial injuries. By these

injuries the upper wall of the orbit, meninges and the brain are wounded.

3. On the basis of numerous ophthalmoscopic and clinical observations he considers that concussion of the eye and brain is nothing but the disturbance of their vascular system. The severity of concussion is in direct proportion to this disturbance, which may result in varying degrees of degeneration of the nervous tissue of the retina and cortical visual centres.

4. Among 100 wounded there were 2·25 eye injuries and 20·4 injuries to the head. Rifle bullets gave two-thirds of all of the orbital and of the eye injuries penetrating through and through. One-third of such wounds was inflicted by artillery fire. A patient suffering from an eye-wound stayed in a hospital on an average 46·8 days.

5. The eye injuries in the war are accompanied by dense adhesions of the sclera and the destroyed choroid to the underlying tissue which greatly increases the difficulty of enucleation of the globe; therefore the author suggests that such cases of eye injuries should be sent to a centre where there is an oculist. The fear of sympathetic ophthalmitis is exaggerated: the author has seen only one case of sympathetic irritation which occurred on the twenty-sixth day after the patient had been wounded.

6. Among 100 cases of eye injuries an eye had to be enucleated in 50 cases. Among 100 cases of eye injuries and concussion 77 men lost the sight in one eye and 11·8—in both eyes. The present war threatens to produce a still greater number of blind than the last war, as in trench warfare the head, face and eyes are more often wounded than in "open warfare."

BIBLIOGRAPHY

1. CRUISE, R. R.—Protection of the Eye in Warfare. *Brit. Jl. Ophthal.*, Vol. I, pp. 489-492, 1917.
2. DARIER.—Blessures oculaires de guérre. *Bull. de l'Acad. de Med.*, No. 15, p. 455, 1915.
3. GRASSET.—Les psychoneurosis de guérre. *Presse Méd.*, No. 14, 1915
4. GORDON HOLMES.—(1) Disturbances of vision by cerebral lesions. *Brit. Jl. Ophthal.*, Vol. II, pp. 352-383, 1918.
   ——— (2) Disturbances of visual orientation. *Brit. Jl. Ophthal.*, Vol. II, pp. 449-506, 1918.
5. HINE, M. L.—Recovery of field vision in concussion injuries of the occipital cortex. *Brit. Jl. Ophthal.*, Vol. II, pp. 12-25, 1918.
6. HOLMES and LISTER.—Disturbances of vision from cerebral lesions with special references to the cortical representation of the macula. *Brain*, June, 1916.
7. JESSOP, W. H.—On the papilloedema in gunshot injuries of the vault of the skull. *The Ophthalmoscope*, No. 12, p. 592, December, 1915.
8. KENNEDY, J. W —Artillery. *British Encyclopaedia*, Vol. II, p. 470, 1929.
9. LISTER, SIR W.—Some concussion changes met with in military practice. *Brit. Jl. Ophthal.*, pp. 305-318, July, 1924.

10. LAGRANGE, F.—Atlas d'ophtalmoscopie de guérre. Masson et Cie., Editeurs. Paris, 1918.
11. DE LAPERSONNE.—Indication opératoire dans les blessures de guérre orbito-oculaires. *Bull. de l'Acad. de Méd.*, No. 1, pp. 41–44, 1915.
12. MARIE PIERRE et CHARLES CHATELLIN.—Revue neurologique. Novembre-Décembre, 1915. *Bull. de l'Acad. de Méd.*, No. 24, 1915.
13. OGUCHI.—Augenverletzungen in japanischen Heere wahrend des letzten Krieges. *Beit. z. Augenheilk.*, H. 83, 1913.
14. PARSONS.—The psychology of traumatic amblyopia following the explosion of shells. *Lancet*, April 3, 1915.
15. SHIMKIN, N. I.—(1) Injuries of visual organ in the present war. *Vestnik Ophtal.*, No. 2, February, 1916.
——— (2) Gunshot injuries of the orbit and its contents. *Vestnik Ophtal.*, No. 4–5, 1916.
——— (3) Concussions of eyes in the war. *Vestnik Ophtal.*, Nos. 6, 7, 8, 9, 1916.
——— (4) Disturbances of intra cranial visual paths and cortical visual region owing to gunshot injuries of the skull in war. *Vracheb. Gaz.*, No. 2, 1916.
——— (5) Gunshot injuries of the eye in the world war. Dissertation for the Degree of M.D. Delivered at the University of Kieff. Published at Odessa, 1917. (Ref. Book Notices, *Brit. Jl. Ophthal.*, p. 620, November, 1926.
16. UHTHOFF, W.—(1) Ueber die Verletzungen des zentralen Sehbahnes u. des Sehzentrum bei Schädel-resp. Hinterhauptschüssen. *Ber. d. Ophthal. Gesell.*, Heidelberg, 1916.
——— (2) Handbuch d. ärztlichen Erfahrungen im Weltkriege. *Klin. Monatsbl. f. Augenheilk.*, Bd. V, pp. 303–319, 1922.

A CASE OF LUXATIO BULBI

BY

EDWARD C. ZORAB *and* W. LINDSAY BURNS

(MOORFIELDS EYE HOSPITAL)

AMONG the many "black-out" casualties seen nowadays the following case seemed to us worthy of record because of its comparative rarity.

W. F., an A.F.S. fireman, aged 29 years, attended on October 29 at 11 p.m. with a history that he had fallen over in the dark and struck his face on something which he thought was the edge of a biscuit tin three quarters of an hour previously. He had never before had any trouble with his eyes and was not normally subject to exophthalmos. His left eyeball was dislocated anteriorly, and the lids, which were in much spasm, were almost closed behind the eye. The cornea was completely denuded of epithelium, and there was a large conjunctival tear 5 mm. posterior to the limbus from 6 o'clock to 1 o'clock on the nasal side, there was bruising of both lids, and a certain amount of subconjunctival haemorrhage, but none of the muscles, which could be clearly seen, appeared to be ruptured. The eye was almost immobile, but gave little or no pain. The pupil was small and reacted only very faintly to a bright light.

The fundus could not be seen in detail owing to the corneal abrasion, but it appeared to be very pale in comparison with that of the right eye. The left vision was perception of light only. The right vision was 6/36. A left facial nerve block was given immediately with 4 per cent. novocain at the neck of the mandible, and after a few minutes the spasm of the eyelids relaxed and the globe was able to be replaced. Almost immediately the vision improved, the pupil reaction became brisk, and the colour of the fundus returned to normal. After a few more minutes he could count fingers at two metres, and his ocular movements, though restricted, were all present. There was still some exophthalmos, due presumably to retro-ocular haemorrhage, but the lids closed easily over the globe. The eye was irrigated, atropine drops instilled, and the lids were closed with strapping, and a pad and bandage applied. He was admitted to hospital.

The following day the lids were bruised and swollen, but the exophthalmos was less marked. Movements were limited in all directions but apart from a little aching there was no pain. The edges of the conjunctival wound were ragged and torn and rather dirty, but the cornea was healing. On the third day his vision was tested and was found to be:—Right eye 6/5 partly with $\frac{-0{\cdot}25 \text{ sph.}}{-2{\cdot}\ 5 \text{ cyl.}}$ Left eye 6/5 partly with $\frac{-0{\cdot}25 \text{ sph.}}{-2{\cdot}\ 0 \text{ cyl.}}$ On the fourth day the conjunctiva which had gaped rather widely was sutured with a few interrupted sutures. Moderately severe inflammation of Tenon's capsule followed for which he was treated with irrigations, metaphen drops, short wave diathermy, and M. and B. 693. The dosage of the latter was 3 tablets t.d.s. for three days, 2 tablets t.d.s. for three days, 1 tablet t.d.s. for three days. The inflammation of Tenon's capsule slowly subsided, and with it the exophthalmos also. He left hospital after nineteen days with a clear cornea, full movements, and 6/5 vision, with correction in each eye. There are not a great number of cases of luxatio bulbi in the literature, apart from the non-traumatic variety occurring in high myopes and proptosed eyes. Würdemann[1] describes several cases, but in most of them there was some complication such as fracture of the orbit or rupture of ocular muscles. Cases used to be seen as the result of gouging with the thumb in street brawls many years ago. Von Hippel[2] reports a somewhat similar case in which the ophthalmic artery was torn, but not the optic nerve. Although the eye was replaced it was quite blind.

Parsons[3] mentions three different types of luxatio bulbi:—

(*a*) Occurring in infants during obstructed labour in which forceps are used.

(*b*) Self inflicted injuries by lunatics.

(c) Injury by striking the eye on some object, as in the present case.

The chief points of interest are:—

1. The mechanism of the injury, and non-rupture of the ocular muscles.
2. The anaemia of the fundus, presumably due to stretching of the optic nerve and contained artery, and complete recovery of vision after three quarters of an hour's luxation.
3. Comparative lack of pain throughout.
4. Absence of signs in the fundus.
5. Response of the inflammation of Tenon's capsule to M. and B. 693 and diathermy.

We are indebted to Mr. Humphrey Neame for permission to publish the case.

BIBLIOGRAPHY

1. WÜRDEMANN.—"Injuries of the Eye." Kimpton, U.S.A., 1932.
2. VON HIPPEL.—*Deutsche med. Wochenschr.*, No. 40, 1907.
3. PARSONS.—The Pathology of the Eye, Vol. IV, p 1179, 1908.

CYCLODIATHERMYPUNCTURE IN CASES OF GLAUCOMA*

BY

PROF. DR. ALFRED VOGT

ZÜRICH, SWITZERLAND

IT is now three years since I and my assistants first made use of the C.D.P. (diathermypunctures of the ciliary body) against glaucoma so that I now feel it essential to describe this operation to my colleagues as well as to recommend it to them as a valuable antiglaucoma-operation.

Three years ago when I described the operation for the first time (*Schweiz. med. Wochenschr.*, 1936, p. 593, and *Swiss Ophthal. Soc.*, Geneva, June 4, 1936, published in the *Klin. Monatsbl. f. Augenheilk.*, Vol. C., p. 672) I not only stressed its advantages, but especially pointed out its dangers.

These dangers, which I described fully (*Klin. Monatsbl. f. Augenheilk.*, Vol. XCIX., July 9, 1937), we succeeded in reducing and eventually avoiding during these three years, so I believe

* Translated from the German by Mrs. Helen F. Sieger-Bechtler, and Dr. med. G. Gerhart Meyer.

that I can now safely recommend to all my operating colleagues the method of C.D.P. in the fight against the most destructive of all eye-diseases.

When is the C.D.P. indicated, and when not?

I consider it a matter of course that in cases of acute primary glaucoma the classic iridectomy of von Graefe should, if possible, be used. The method as described by Graefe is the best, but if the anterior chamber is very shallow the iridectomia tangentialis (Salzmann, Vogt, vide *Monatsbl. f. Augenheilk.*, Vol. C., p. 131, 1938) is preferable. I have not hitherto made use of the C.D.P. in such cases of glaucoma.

When a chronic primary glaucoma has to be operated on the situation is different. The C.D.P. can here seriously compete with the methods aiming at subconjunctival filtration, *i.e.*, with trephining after Elliot, with the sclerectomy of Lagrange or the iridencleisis of Holth. For the C.D.P. does not involve the danger of all those methods with subconjunctival filtration, viz., secondary infection which may result in acute panophthalmitis or even in sympathetic ophthalmitis especially frequent after trephining and iris inclusion. Sympathetic ophthalmitis has so far never been observed after C.D.P., nor has it ever been found in other methods of ignipuncture of the eye. (We must remember that for 60 years punctures with the electric needle (de Wecker, Abadie, 1881) and the Paquélin have been employed for countless perforations of the uveal tract (detachment of the retina). These have never resulted in sympathetic ophthalmitis).

The C.D.P. has been performed hundreds of times and has never shown such after effects. Obviously because the method produces scars of the sclera which do not permit a secondary infection. Probably also because the needle has a temperature of over 1,000° centigrades.

To be on the safe side we have hitherto confined the C.D.P. to those severe cases where iridectomy and other methods with subconjunctival filtration had failed. Every ophthalmologist has at times found himself at a loss to combat certain malignant forms of glaucoma. Especially in these cases the C.D.P. can be of great use.

The C.D.P. has been of great service to us in all those cases where, owing to high tension the anterior chamber had disappeared, either after an ineffectual iridectomy or after trephining. Miotics are of no use in these cases. The lens and the iris remain pressed against the cornea and the surgeon can do nothing but watch his patient go blind. No operation from iridectomy up to cyclodialysis and sclerotomy had until now been possible without the existence of a chamber. In these cases the C.D.P. is the saving operation. Its technique is even in such desperate cases

a *simple* one and the surprising result can already be seen on the following day by the forming of a deep or medium deep chamber, provided always that the case was not of too long a standing. After this result of the C.D.P. any other of the intra-ocular operations from iridectomy to extraction is again possible.

This result alone justifies the discovery of the C.D.P. and to-day I deeply regret that I did not know of it earlier for such desperate cases.

When is the C.D.P. indicated in cases of secondary glaucoma? Whenever a simple iridectomy is not sufficient. There are malignant cases of acute iritis followed by severest secondary glaucoma when iridectomy only causes a haemorrhage in the shallow chamber but not even a temporary lowering of the high tension. The eye remains hard with hardly an anterior chamber. I lost a similar case where both eyes were affected 10 years ago. To-day I would under similar circumstances use the C.D.P. and probably with better results.

Iritis itself as far as I can tell from my comparatively few cases has not been unfavourably influenced by the C.D.P. An eighty year old patient had undergone trephining on account of primary glaucoma. After some months a subacute iritis was observed and the other eye, likewise affected by glaucoma, showed deposits and an opacity of the anterior chamber. Sympathetic ophthalmitis was of course suspected. The C.D.P. brought back not only a normal tension but the deposits disappeared and never returned during the 18 months that I could follow the case.

Another example. A thirty-two year old lady had high tension in both eyes with numerous deposits. In spite of an apparently correctly performed trephining combined with iridectomy on the left eye glaucoma absolutum followed. The same fate threatened the right eye after I had in vain performed the same operation on it. The tension rose to 50-60 mm. Hg in spite of all miotics. The first C.D.P. operation made from above reduced the tension for a couple of months to subnormal and normal values and the deposits diminished. But afterwards the tension rose again to 40-50 mm. Hg although miotics were freely applied. The second C.D.P. was performed from below. It brought about a longer and better reduction of the tension of the eye. After four months a third operation on the temporal part of the sclera became necessary. The tension is now normal. In the meantime the deposits had not entirely disappeared but they had at least considerably diminished. (There were no nodules on the iris, no signs of a tubercular affection and the blood Wassermann was negative.)

It appears therefore that iritis is influenced not unfavourably by the C.D.P. and it is no contra-indication.

The question arises whether the method is suitable to bring back

to normal tension the hitherto intractable cases of glaucoma haemorrhagicum, for instance after obstruction of the central retinal vein. From my experience the C.D.P. can be attempted without any danger in this form of glaucoma. Extensively employed, it now and then gives permanent success and makes an enucleation avoidable, but in my cases failures have been in the majority. It must be remembered that in these cases this operation can be repeated on the same eye several times. Before operating a careful examination with the slit-lamp should never be omitted. One will thus frequently find signs of iritis and deposits on the cornea for which one might have, without this examination, blamed the operation.

The special character of this form of glaucoma which begins with a disturbance in the posterior part of the eye can sometimes be proved by giving atropine and hyoscine as I did in a certain number of cases which had become blind and were destined for enucleation. In some cases these mydriatics lowered the tension considerably instead of raising it as should have been expected. At the same time the patients were relieved of their pains.

How can the dangers of this new method which I described in the above-mentioned papers of 1936 and 1937 be avoided?

The cornea and the lens are of course in more danger of being injured than the iris, the vitreous, or the retina.

As far as the cornea is concerned a keratitis, a necrosis, or a permanent blurring may follow when operating too near to the limbus. The operator who approaches the limbus corneae with his diathermy-needle closer than two and a half mm. runs the risk of damaging the cornea. These injuries may consist of blurrings which may become vascularised, eventually even in ulcers and necrosis. In these cases conjunctival plastic operations give very bad results.

The possibility of damaging the lens and starting a cataract is the greater in proportion to the length and thickness of the needle employed. The needle must under no circumstances be longer than 0·5 mm. from its point to the stop unless the lens is missing or is completely opaque. In aphakic cases the needle can exceptionally be 1 mm. long.

Too thick needles increase the danger of haemorrhages. The needles with a stop which I had made for me by Grieshaber (Schaffhausen) have a thickness of 0·15 to 0·18 mm.

With needles of this length and thickness damage to the lens is unlikely. I have had no experience, however, with those rarer forms of glaucoma in which an abnormally large and thick lens touches the ciliary body with its equator to the extent of even compressing it. But even in these cases a 0·5 mm. needle will not be able to cause a traumatic cataract because the sclera and the

ciliary body together are considerably thicker measuring according to Salzmann 0·8 mm. at their thickest point. As a result of these important anatomical facts it follows that one must not operate without a stop.

The iris can be endangered on the one hand by a haemorrhage which may take place 8-14 days after the operation, and on the other hand by exudative iritis. The danger of this is lessened in proportion to the fineness of the needle employed and the further away one keeps from the limbus corneae. In the last year and a half I have not had any cases of haemorrhage or severe iritis because, as a matter of fact, at a certain distance from the limbus one does not touch the root of the iris.

A hyperaemic iris and an increased opaqueness of the anterior chamber follow as a rule one or two days after the operation. A slight exudation is not infrequent.

It is important to set a slight lesion of the vitreous without injuring it too much.

A small loss of vitreous is not only unavoidable but it is even desirable that a little vitreous fluid trickles out. The punctures are very numerous but as a rule so minute that only a watery fluid oozes out and not real consistent vitreous. Larger losses can only occur if the punctures are so numerous as to become confluent. Practically one can reckon that only the smallest loss of vitreous takes place and this is of therapeutic value. It means a relief for the lens especially where an enlarged vitreous presses it forward sometimes even against the cornea. The further away we operate from the limbus the greater is the loss of vitreous to be anticipated.

We have never met with a detachment of the retina as a result of this minute loss of vitreous. However, we must always be careful to keep this loss within the smallest possible limit.

It is perfectly right that a C.D.P. which begins only $2\frac{1}{2}$ mm. from the limbus and reaches to about 4-5 mm. behind lies for the greater part back of the ciliary body and includes more the orbiculus ciliaris up to the ora serrata. According to the excellent measurements of Hans Wagner as well as of former authors the anterior border of the retina, *i.e.*, the ora serrata reaches in the case of an emmetropic eye on the average nasally to 5-7 mm. behind the limbus corneae, temporally, above and below to 6-$7\frac{1}{2}$ mm. In the myopic eye with its long axis the distance is greater than in the emmetropic and hyperopic eye.

Against this argument may be said that purely from the anatomical point of view the ciliary body and the pars plana form an entity. An authoritative expert on this part of the eye such as Maximilian Salzmann, said in his work " Anatomie und Histologie des menschlichen Augapfels " (Leipzig and Vienna),

1912, p. 116, that the ciliary body forms a girdle which is narrower on the nasal side and above (4·66-5·2 mm.) and broader on the temporal side and below (5·6-6·3 mm.). Salzmann believes that the corona ciliaris (anterior part) and the orbiculus ciliaris, that means the whole girdle from the root of the iris backwards to the ora serrata (anterior part of the retina), form the ciliary body. (Fig. 1.)

Thus the zone of our operations reaches dorsally as far as the orbiculus ciliaris, *i.e.*, the pars plana corporis ciliaris and even into the neighbourhood of the retina.

Is the retina endangered when its foremost part is reached by the therapeutic punctures? According to my experiences up to now I can reply in the negative. Haemorrhages in the periphery of the retina are not to be feared, as only capillary vessels reach this part of the retina. One must however bear in mind the possibility of a haemorrhage of the choroid and I think that as in detachment operations such haemorrhages will sometimes occur. The safest way of avoiding this is the use of a needle of the above mentioned fineness and shortness. In the course of our observations haemorrhages were rare exceptions.

We must make some mention as to the possibility of a necrosis of the sclera. I had a case of a sixty-one year old emmetrope who had had repeated trephinings and had lost his right eye. The tension was 30-35 mm. Hg which had eventually resulted in reducing the visual field on the nasal side almost to the centre, although two trephinings had been made twelve years ago and pilocarpine-eserine had been given six times daily over a period of many years. I made a very extensive C.D.P. below. After 10 days a small necrosis of the sclera with a drop of vitreous in the centre was noticed in the region of the C.D.P. about 6 mm. from the limbus and with a diameter of about 3 mm. A conjunctival flap was carefully placed over the spot without touching the vitreous but it detached itself again after three days, so that I had to sew the sclera (going through sclera and conjunctiva with a fine needle made by Grieshaber after my special instructions and with fine black silk without touching the vitreous), and this definitely closed the opening of the sclera. The thread was left for 6 days and the tension to-day 3 months after the operation is normal to subnormal, no drops being used; retina normal; vision and visual field as before the operation.

Examples of the Method of Operation

Above all we employ the C.D.P. almost exclusively in cases of glaucoma haemorrhagicum, further in cases of aphakic eyes or after contusions where glaucoma is caused by the vitreous

obstructing the angle of the anterior chamber, as well as in the similar cases of traumatic or spontaneous luxation of the lens. In the remaining cases the C.D.P. is a secondary operation after iridectomy or an operation aiming at subconjunctival filtration, sclerotomy or cyclodialysis had been previously performed without success.

As a rule we perform the first C.D.P. below (Fig. 2). Subconjunctival anaesthesia with novadrin

(Novocaini hydrochl. 1·0
Adrenalin hydrochl. 1 : 1,000 gutt. X.
Aq. dest. ad 50·0.)

The lids are held apart with hooks. An incision of the conjunctiva near the insertion of the rectus inf. is then made which reaches on the nasal and temporal side to the insertions of the rectus int. and ext. The rectus inf. is completely anaesthetised with 1 c.cm. novadrin. The sclera and the insertions of the rectus inf. are then laid free of the conjunctiva. Within a zone of 1-2 mm. width along the limbus we do not detach the conjunctiva. The completely anaesthetised insertion of the rectus inf. is then narrowed through short incisions on both sides, but care is taken not to sever it. Now a girdle of about 2½ mm. in width just above the insertion and between the insertion and the limbus is punctured with the diathermy-needle (length 0·5 mm.; thickness 0·16-0·18 mm.) using about 60 milliamperes (zone *a* Fig. 2) in such a manner that the needle (furnished with a stop) is pushed into the sclera vertically and at intervals of ½-1/4 mm. and is left there for from ½-1 seconds. We then work upon the parts marked *b* and *c* the punctures reaching as far as the insertion of the rectus inf.; on the nasal and temporal side the punctured areas reach to within a distance of 2 mm. of the insertion of the rectus med. and lat. *One must avoid approaching the limbus corneae with the punctures nearer than 2-2½ mm.*

The surface of the sclera must be carefully kept dry of blood and vitreous before inserting the needle as otherwise there is the risk of the needle being cold while being pushed into the sclera. Only the point of the needle which punctures the sclera becomes glowing hot.

After placing a hundred or more punctures the conjunctiva is carefully resown with catgut. Afterwards a sterile bandage with an ointment of boric acid.

Usually the eye is very hypotonic immediately after the operation.

If the tension is not very low on the second day pilocarpine can be given.

Frequently the tension becomes normal only several days after operating.

When operating above or on the nasal or temporal side the proceeding is the same.

Let us consider in what topographical relation to the ora serrata we find ourselves when we insert the needle in front of and behind the insertion of the straight eye-muscles. E. Fuchs gives (*Graefe's Arch. f. Ophthal.*, Vol. XXX., p. 1, 1881) the following distances of the muscle-insertions from the limbus: M. rectus medialis, 5·5 mm.; M. rectus laterialis, 6·9 mm.; M. rectus sup., 7·7 mm.; M. rectus inf., 6·5 mm.

The distance of the ora serrata from the limbus according to the above cited measurements of Hans Wagner is in the emmetropic eye 5-7 mm. on the nasal side (insertion of the muscle according to Fuchs 5·5 mm.). Nasally it coincides therefore approximately with the insertion of the muscle. On the temporal side, above and below, the distance of the ora according to Wagner measures 6-7½ mm. and accordingly the insertion coincides here, too, with the outer border of the retina within a fraction

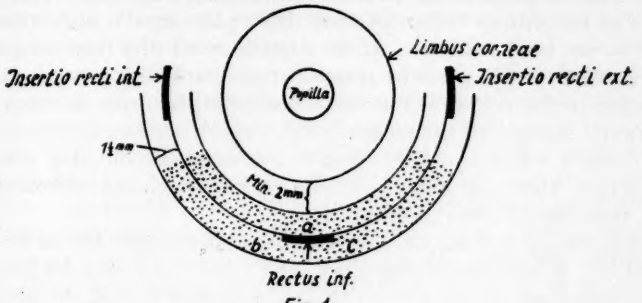

Fig. 1

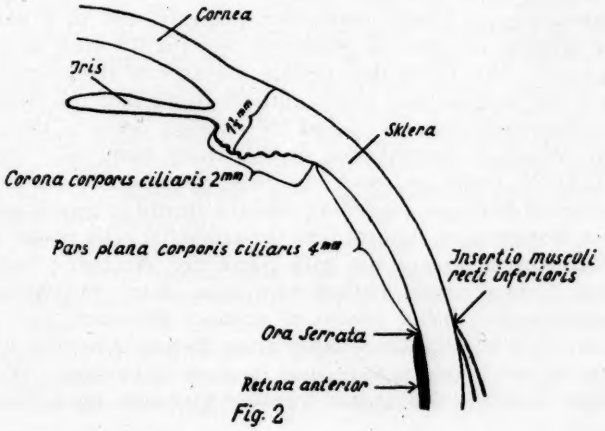

Fig. 2

of 1-1½ mm. at the utmost. We thus get close to the nasal serrated border of the retina if we make our punctures close to the insertion, but when 2-4 mm. in front of it, to the neighbourhood of the pars plana corporis ciliaris (Fig. 1) *i.e.*, to the rear part of the corona ciliaris.

My own experiments with some freshly enucleated eyes 23-25 mm. long confirm these findings. I halved the eyes in the equator after they had lain in formalin for several hours and inserted a needle close behind the insertion of the M. rectus int., sup., lat. and inf. I could see the point of the needle emerging exactly in the region of the ora serrata or close in front of it, in the pars plana. The needles which I used were 5 mm. long. Such experiments are also in other ways very instructive for topographical studies of the eye. If after halving the eye we insert the needle from the inside into the inner surface of the ciliary body vertically right through the sclera the point of the needle emerges on the outside 1-1½ mm. from the edge of the cornea. If we therefore wish to perform the C.D.P. on the most anterior and thickest part of the ciliary body we must insert the needle very close to the border of the cornea. If we want to reach the rear margin of the corona ciliaris we must insert our needle 2 mm. away from the margin of the cornea. On the other hand, in order to reach the posterior margin of the ciliary body, the ora serrata, *i.e.*, the front part of the retina, I would have to insert my needle at a distance of 6 mm. from the margin of the cornea, *i.e.*, approximately at the insertion of the muscles.

We can as yet scarcely give a theoretical explanation for the C.D.P. While developing the C.D.P. method I took for granted the correctness of the generally accepted theory, that the aqueous fluid is secreted by the ciliary body. A reduction of this secretion by damaging the ciliary body may possibly lead to a lowering of the tension in cases of glaucoma, eventually even to a state of balance. We know that certain diseases of the ciliary body show a low tension and many authors think that the hypotonic effect of cyclodialysis is caused by damage done to the ciliary body. Whether cauterisation of the ciliary body as a result of the C.D.P. tends to work in this direction I cannot say. Histological findings, regarding which I intend to report later on, appear, however, to confirm that the epithelial cells of the ciliary body and especially of the pars plana are affected. Such permanent damage would explain why some of my successful cases three years after being healed of primary glaucoma by C.D.P. withstand the application of mydriatics, homatropine and atropine without showing any pathological increase of tension. We must therefore conclude that certain forms of glaucoma must have quite

a different aetiology from the hitherto accepted theories propounded by Knie and Weber, *i.e.*, it is a matter of a too abundant secretion of aqueous fluid in comparison to its means of drainage rather than of a clogging of the anterior drainage. But other possibilities must also be considered. Let us be satisfied with the fact that the C.D.P. can be of use in the severest cases of glaucoma.

AMBLYOPIA EX ANOPSIA IN CHILDREN

BY

J. HORTON YOUNG

CHELMSFORD

A New Type of Ventilating Occluder

AMBLYOPIA ex anopsia in children is an ever growing practical problem. Among the school children of Essex there are approximately 2,500 " squinting " children, this total including only those children who come directly under the control of the Essex County Council Ophthalmic Service, and excludes those cases which are to be found within the autonomous borough councils. When one considers the problem from a national angle the total number of " squinting " children must reach staggering proportions. The incidence of " squint " appears to be increasing.

School children in this country are not all treated by ophthalmic surgeons and the result is that amblyopia must predominate in those areas where this specialised service is not available, although it would be very wrong to state that it was limited to these areas.

The fact is that most parents are not sufficiently well informed in a lay sense on the disabilities resulting from " squint," that many school medical officers are completely ignorant of the urgent necessity of getting the amblyopic eye to " see " as soon as possible, and that those who do attempt to counteract the amblyopia become discouraged when the instruments, which they are asked to use, break down in practice. The average medical officer finds it hard to decide when amblyopia is present in younger children. Moreover, the practice of *not* doing a post-retinoscopic subjective test is still very prevalent.

Also a satisfactory occluder for these cases has not been designed, although much time and patience have been put into this problem, as is evidenced by the numerous types of occluder to be found on the market, each in its turn attempting to counteract the disadvantages of previous models.

To aggravate the problem a great number of these " squinting " children are not detected until they reach the infants' department

of the elementary school, and in many cases not until the children have had their second full examination at eight years of age. At this stage they usually have a well-established amblyopia. Strenuous efforts are being made through the child welfare centres and the toddlers' clinics to get the cases earlier. The first six months of a child's school career is the period during which some of the most intractable " squints " develop. These children of four years and upwards, being active and inquisitive are poor co-operators when occlusion is attempted, for this, depriving them of their visual acuity, virtually renders them blind persons for a period, renders them prone to accident and subjects them to such a restriction of activity, that their childish natures, not comprehending the necessity for treatment, revolt. Is it any wonder then that " peeping " is a common feature of " squint " cases, when month after month the vision remains unimproved, until in desperation the oculist orders a complete " black-out " with elastoplast or some other medium. But this is impracticable, for the dressing has to be replaced every week, is unhygienic, uncomfortable, and entails considerable expense and inconvenience to parents. Parents co-operate badly under such conditions.

In an endeavour to settle the problem from all points of view, I decided to design an occluder to deal with the difficult cases of four years and upwards. The result is an occluder of a new type called an " AERO-OCCLUDER," details of which are given below. Photographs of the instrument are to be seen in Figs. 1 and 2.

The " AERO-OCCLUDER " has been designed for permanent total occlusion over a period of six weeks or more. This new occluder is a composite structure of xylo and rubber. The xylo portion consists of a circular perforated basal plate " B " (available in three sizes, 34, 36, 38 mms. diameter) easily trimmed to fit the frame " D," which takes the place of the spectacle lens before the non-amblyopic eye. The spectacle lens is retained by the dispensing optician until the period of occlusion is finished. A small box " BP " with lateral vents " VV " is attached to this basal plate " B " posteriorly—the ventilating unit. A rubber lateral occluding wing " W " is fixed to this box " BP " by a flange " F " which keeps the rubber wing pressed against the perforated basal plate " B," and permits the vents " VV " to open into the rubber cup formed by the rubber occluding wing " W." The medial edge of the rubber wing is thinned and extended so that it passes well on to the bridge of the nose. This prevents peeping.

When the " AERO-OCCLUDER " is in position on the child's face, air passes through the perforations " B " in the basal plate " BP," through the vents " VV " and circulates around the eye. The more the child runs about the greater the ventilation.

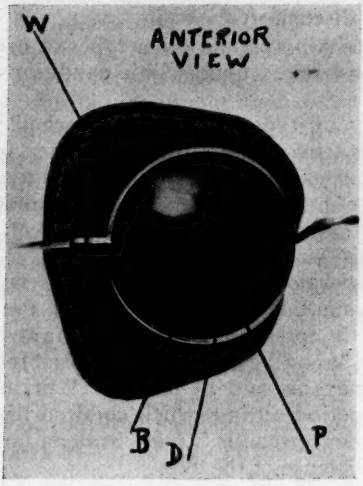

FIG. 1.

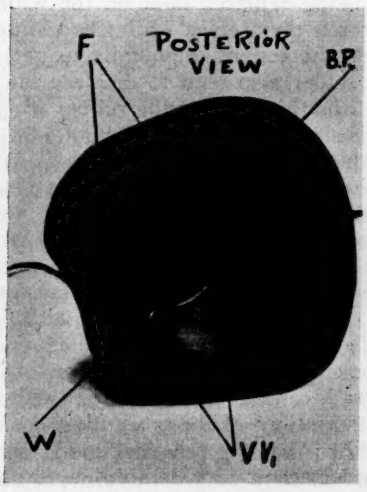

FIG. 2.

The base of the ventilating box " BP " is the baffle plate whereby the child is prevented from looking through the perforations " P." Complete occlusion is assured and the unique

ventilating system prevents the heating effect of other occluders with its attendant discomfort.

Theoretically speaking certain other types of occluder appear to be quite sound until tested under clinic conditions when they fail badly.

With the fixed cup type of occluder attached to the spectacle frame behind the lens, it is a common thing to find that this deforms the spectacles and that an accurate fitting is difficult to obtain. Moreover the children, by slightly moving the frame or the occluder, are easily enabled to peep between the side of the nose and the medial side of the occluder.

These children develop a characteristic poise such that the chin is thrown to the same side as the occluded eye, the head is inclined slightly forward, the forehead dropped and turned in the direction of the gaze of the "good" eye which is released from its occlusion. These children may be said to have an " occluder torticollis." Considering the period during which children have to wear these occluders " occluder torticollis " must have an unfavourable effect upon the muscle balance of the eyes.

The rubber sucker types of occluder also have their draw-backs and, while they give satisfactory occlusion, are apt to " sweat " excessively, are readily detachable by the children or parents with the possibility of being replaced later on the wrong eye. Moreover they may detach themselves while the children are at play and get lost, when the parent often fails to get them replaced. These types of occluder also tend to displace the spectacle from the nose, owing to the thickness of the rubber wing on the medial side, and the large size of sucker attachment.

It is to combat this loss of efficiency that the "AERO-OCCLUDER" replaces the lens in the spectacle frame. As a result the children are offered two alternatives only, either to wear the spectacles with its fixed occluder or to leave them off altogether. As these children are usually fairly hypermetropic they feel the need of spectacles, and the immediate result is an improvement in vision in the " sqinting " eye. Failure to improve in vision indicates one of two things: (1) non-co-operation; (2) some pathological state previously overlooked. The remedy is then obvious, since the " AERO-OCCLUDER " cannot be interfered with except by the express order (prescription) of the consulting oculist.

It will be seen then that the practical conditions governing the choice of an occluder are of considerable importance.

The rate of improvement of vision in the amblyopic eye depends mainly on the age of the child, those children under four years of age developing alternation (cover test) and ability to see Worth's ivory balls within six weeks. Indeed in these young children one may get a reversal of vision such that the non-

amblyopic eye becomes the amblyopic one. This reversal is rarely seen in children of five years and over, as the macular perceptions become more stable. It is true that a temporary diminution may be found in some cases but the full visual acuity comes back if occlusion is discontinued for a few days. The " master " eye appears to have " priority " like being right-handed or left-handed, as it were, although there appears to be no definite relationship in squinting cases as regards the " master " eye and right or left-handedness.

When alternation has been proved in a young child it is better to maintain alternating daily occlusion for some time in order to " stabilize " the alternation since in this way the visual acuity is preserved in each eye. A simple flat " clip on " disc type of occluder is all that is required for this purpose. The visual acuity, however, remains the criterion on which any treatment is carried out.

With children of four years and upwards the rate of improvement is one to one and a half lines of Snellen's types per month, as judged by those children who can read letters, but the younger members of this age group will have to be tested by the " COIN " test, *e.g.*,

	Approx.
A penny equals	6/18
A halfpenny equals	6/12
A sixpence equals	6/9

or other appropriate children's visual acuity test.

One should remember that a subjective test in children has its limitations in that any test performed is only accurate within the limits of the child's psychology, its intellectual advancement, and its emotional " make-up " (viz., its precociousness). Money, however, by playing upon the material instincts of the children, seems to conquer any backwardness, more especially if a child under examination is promised a halfpenny if he or she can select the coins correctly. This " coin " test is fairly accurate within the limits of the visual angles required in Snellen's test types and works out in practice very well. The children judge by size and colour of coins and not by the inscriptions. If non-recognition is present, the parent is advised to teach the child the difference between the coins before coming to visit the oculist at his next clinic.

Messrs. Alfred Hawes and Son are the makers of this instrument. I am indebted to them for their helpful co-operation and suggestions.

ANNOTATION

Ophthalmic "Humbugs"

The eye has always been a happy hunting ground for the charlatan. It would probably not be easy at the present time to find an exponent of ophthalmic quackery whose personality and showmanship compared with that of the Chevalier Taylor in the reigns of the first two Georges. But it is evident from the utterances and writings of the "humbugs" of to-day that the characteristics of the breed have not changed to any marked extent during the past couple of centuries. Boastfulness, pomposity, guarantees of certain cures in all sorts of cases, often by the same methods of treatment, no matter how different the origin of the particular complaint; vulgar showmanship and self-advertisement, either by loud trumpetings or sometimes by subtle and insidious methods, with an occasional display of mock modesty, are among the obvious signs that brand them.

With regard to their writings the "humbugs" of to-day probably compare unfavourably with the Chevalier Taylor; every one admits that his professional knowledge was good, in some cases even, in advance of that of his day. But a perusal of some of the writings of to-day makes it difficult to understand how any one with a medical training, or for that matter, without, could write such nonsense, be so ignorant of true ophthalmological facts and so out of date in their ideas about surgical intervention and what it achieves.

Cures for cataract without operation have long been in evidence among us. It all depends on what one means by cataract, but it can safely be maintained that there is no treatment for mature cataract other than by operation; and it is not unfair to say that in the great majority of cases the results are good and the danger to the eye very small indeed. Accidents unfortunately do happen, but their percentage in most hands is infinitesimal.

It is tragic that patients suffering from chronic glaucoma or retinal detachment, to name only a couple of examples, should waste time over questionable methods of treatment. Delay only leads to blindness and there is much need for a more vigorous education of the public on the danger of obtaining advice and treatment from unqualified practitioners.

The elder Pliny is credited with the sentiment that no book is so bad that nothing good can be found in it. He would hardly have said so could he have seen some of the works which it has been our misfortune to read recently.

THE COUNCIL OF BRITISH OPHTHALMOLOGISTS

The activities of this Council have unfortunately been restricted during the past year.

A Committee was set up to deal with the question of the standardisation of Snellen's test types but owing to the war this Committee was unable to hold any meetings.

The Council continue to supervise the affairs of the Orthoptic Board.

Beyond this there is nothing to report; but at the same time the Council particularly wish it to be understood that it is always ready to deal with any urgent matters brought to its notice about which an expression of opinion from the Council is desirable.

ANNUAL CONGRESS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM

The Annual Congress of the Society was held at the Royal Society of Medicine on April 25 and 26, 1940, under the presidency of Mr. Harrison Butler.

The Nettleship Medal was presented by the President to Dr. Dorothy Campbell, who returned thanks.

The following is the abstract of the papers read.

THE PRESIDENT,

"Anomalies of the Posterior Layers of the Lens."

Drawings shown of cases of Lenticonus Posticus, and the anomaly described, together with some remarks upon puddlers' and glass-blowers' cataract, with illustrative drawings, and changes in the posterior capsule seen after perforations of the globe, with drawings.

MR. M. L. HINE,

"Six Months at an Emergency Ophthalmic Hospital."

This was not a scientific contribution, but put on record, as a matter of possible interest, how one emergency base did its work during the unexpected initial waiting period of the war.

MR. H. M. TRAQUAIR,

"Observations on the Causation and Treatment of Dacryocystitis."

Present views as to causation unsatisfactory. Necessity to take the sex incidence into consideration. The importance of heredity. Bacteriology. The infantile form. Treatment by Toti's operation.

SIR RICHARD CRUISE,

"Preventable Blindness in War."

The necessity for the protection of eyes in War was advocated before the Annual Ophthalmic Congress in 1917.

For details see Volume XXXVII of the *Transactions*, 1917.

An entirely new type of visor has been designed.

The subject is discussed under the following headings:—

1. The type of injury that is the most frequent cause of blindness. By G. S. W.
2. The definition of "Preventable."
3. The method advocated to effect this purpose.

Tests on the stopping power of the visor.

MR. EUGENE WOLFF,

"The External Limiting Membrane of the Retina and its Relation to "Verhoeff's Membrane."

The purpose of this paper is in great part to confirm Verhoeff's description of the membrane he discovered in the pigment layer of the retina. This was thought necessary as the very existence of this structure has often been denied, and it is not even mentioned by Salzmann, and other well-known works on the Histology of the eye.

The present contribution adds some microphotographs which Verhoeff said were difficult or impossible to obtain, and others which are but rarely seen.

MR. EUGENE WOLFF,

"The Blood Supply to the Lamina Cribrosa."

A short contribution intended to correct certain previous statements by the author on this subject.

MR. L. H. SAVIN,

"Tarsectomy for Trachoma."

An apparent increase in the incidence of trachoma is noted in South London. A review of out-patient records shows the inadequacy of ordinary conservative methods of treatment. Many patients with active trachoma only attend hospital on a few occasions. Instances are given of trachoma acquired in London by patients who have never left the country. No system of compulsory notification is in

force. In these circumstances drastic methods of treating the disease seem justified. A series of tarsectomies on 25 trachomatous patients is described.

MR. T. W. LETCHWORTH,

"A Case of Cyclitis of twenty-four years' standing Cured by Tonsillectomy."

MR. G. F. ALEXANDER,

"Ocular Myology."

The law of the primary and secondary actions of the rotator muscles of the eye as generally stated. The error in this law indicated. The traction-line and traction-plane of the above muscles.

The primary and secondary actions of these muscles, and the movements of the anterior pole and vertex of the eye effected by them.

The "effectivity" of the muscles defined. The above law shown to be applicable to the superior and inferior recti; but not to the obliqui. The above law amended so as to be applicable to the obliqui as well as to the superior and inferior recti.

MR. G. F. ALEXANDER,

"Spasm of the Accommodation."

Little consideration given to this subject by oculists.

Cases in which it tends to be present.

Clonic and tonic spasm, with a typical case of each variety.

Factors of causation.

A cycloplegic acting with the efficiency of atropine, and permitting of as rapid recovery from its effects as homatropine.

Sectional spasm of the ciliary muscle, and the conditions inducing it.

DISCUSSION

MR. A. J. BALLANTYNE,

"The Choice of Operation in Glaucoma."

Operative treatment rests on the view that the central fact in all forms of glaucoma is elevation of the intra-ocular pressure, which, if unrelieved, causes destruction of vision through injury to the optic nerve and other intra-ocular structures.

Operation justifies itself in so far as it gives both an immediate and a lasting reduction in pressure, by the simplest procedure, and

with the least risk of complications and dangerous sequelae. As we cannot influence the rate of formation of the intra-ocular fluid, operation can only adjust the fluid balance by opening up intra- or extra-ocular channels for the escape of the aqueous.

This paper will be concerned chiefly with the five representative operations which have been most widely practised—the classical iridectomy of von Graefe which aimed at the opening up of the normal intra-ocular channels (the spaces of Fontana and the canal of Schlemm), the cyclodialysis of Heine, which creates a new intra-ocular passage from the anterior chamber to the suprachoroidal space, and the three procedures which aim at the establishment of sub-conjunctival drainage of the anterior chamber through a filtering scar—sclerectomy according to the methods of Lagrange and Elliot, and the iris-inclusion operation of Holth and others.

Judgment regarding the relative merits of, and indications for, these operations, is difficult for many reasons which will be discussed. Most of the operations have been condemned on account of their shortcomings or dangers in the hands of certain operators, but, while the publication of unsatisfactory results points to the difficulties which may be encountered, and the need for certain precautions, a fair estimate of the merits of the different operations can only be gained from the experience of those who have employed them extensively, and can show *satisfactory* results. Unfortunately, few clinics with sufficient material have been able to try out the different types of operation on a strictly comparable basis.

Iridectomy (von Graefe, 1858) is almost universally accepted as the operation of choice in acute congestive glaucoma. It can be performed with the keratome or the Graefe knife. It is equally applicable to the chronic or sub-acute congestive form, and here there is much to be said for a purely peripheral iridectomy, which opens up the angle, gives a better cosmetic and optical result, and allows the effective use of miotics if necessary. The percentage of good results in simple glaucoma is low (about 10 per cent.) contrasting with the 80-100 per cent. success obtained in primary acute congestive cases.

Among other operations, designed with the object of opening up the angle to provide free access from the anterior chamber to Schlemm's canal, is the Goniotomy of Barkan, 1936 (division of the trabeculae of the pectinate ligament)—a feature of which is that it is carried out under direct observation with the gonioscope. Barkan limits the use of this operation to cases of chronic simple glaucoma of the obstructive type with an open angle.

Iridencleisis (Holth, 1906). The reduction of pressure resulting from iridectomy with accidental inclusion of the iris in the wound, led to attempts to establish a filtering scar by deliberate inclusion of the iris. Herbert's pioneer work (1903) was closely followed

up by that of Holth, whose operation is the form of iris-inclusion most widely practised and most carefully studied.

The pigment epithelium of the iris lining the wound favours the formation of a true filtering scar, while a substantial covering of conjunctiva protects against infection. Holth himself employed the operation in every type of glaucoma. The latest figures (Gjessing, 1939) apply to 198 cases of simple and chronic glaucoma, followed up for from 6 to 280 months. In 73·2 per cent. of the cases a good result was obtained in respect of vision, field of vision and tension.

Sclerectomy. Lagrange (1905) introduced the principle of establishing a scleral fistula from the anterior chamber to the sub-conjunctival lymph spaces. His operation has been practised extensively in all types of glaucoma; but Lagrange limits its use to cases of chronic congestive and simple glaucoma, in which he obtains 85 per cent. of "success."

Sclero Corneal Trephining (Elliot, 1909), has probably been tried out on a larger scale than any of the other modern operations. The wide gap between the most successful and the least successful results, and the multitude of modifications introduced by individual operators, suggest certain technical difficulties in the operation; but in the hands of competent operators it yields an average of 70 to 85 per cent. of favourable results. It is generally admitted that no other operation gives such a satisfactory immediate and lasting reduction of tension. It may be employed in all varieties of glaucoma; but it is principally applicable, like Lagrange's sclerectomy, to simple and chronic congestive glaucoma. In congenital hydrophthalmia it has given better results than any other procedure (65 per cent. favourable).

Cyclodialysis (Heine, 1905) has been widely used, and its results thoroughly investigated. The consensus of opinion is that it is easy, safe and comparatively free from risks of complications. The primary result is not always maintained; but the operation can be repeated. Permanent good results are obtained in about 50 per cent. The principal indications for its use are simple glaucoma, chronic congestive glaucoma, secondary glaucoma after cataract extraction, etc., and as a second operation where some other procedure has failed.

Complications. All operations involving the angle of the anterior chamber carry the risk of complications, such as intra-ocular haemorrhage, injury to the ciliary body and lens, prolapse of iris or vitreous, infection and sympathetic ophthalmia. From the literature it would appear that these are least frequent in cyclodialysis, and most frequent in sclero-corneal trephining; but each of the five operations referred to has been carried out in large series free from serious complications.

MAJOR I. C. MICHAELSON and DR. A. C. P. CAMPBELL.

"The Anatomy of the Finer Retinal Vessels with some Observations on its Significance in Certain Retinal Diseases."

A new technique for demonstrating the finer vessels of the retina was described. Detailed mention was made of the disposition of the capillary system. Certain of the features thus elucidated seem to throw light on the pathogenesis of the retinal changes found in hypertension, arteriosclerosis, diabetes, venous thrombosis and papilloedema.

MR. W. J. B. RIDDELL,

"Two Clinical Tests for Night Blindness."

A woman observed that her small son was night blind like her father. On investigation seven affected male relatives were found. The family was one which would not co-operate in any elaborate tests and a simple clinical method of assessing the disability was required. The visual acuity was recorded by means of Snellen's type in the diminished illumination provided by a standard candle shielded from the patient. Similar observations were made in chronic glaucoma, optic atrophy, retinitis pigmentosa and normal subjects. Gross differences were found which made it possible to identify the affected patients.

As the night blindness was sex-linked it was of importance to investigate the colour vision. With Ishihara's isochromatic plates no abnormality was found but the final group of Stilling's plates (nineteenth edition) was read in a manner indicative of defective perception of blue by those affected with night blindness. There is other evidence which makes this result not unexpected. In cases of night blindness with no objective abnormality a supplementary test which must be carried out in good daylight has certain advantages.

MR. A. RUGG-GUNN,

"A New Binocular Ophthalmoscope."

Advantages of stereoscopic ophthalmoscopy, *e.g.*, in determining presence of papilloedema at an early stage, and especially in demonstrating whether lesions at the macula are raised or not.

Optical principles employed in construction of binocular ophthalmoscopes: path of rays in large Gullstrand ophthalmoscope when adjusted for binocular observation.

Path of rays in new binocular ophthalmoscope. Principle of indirect ophthalmoscopy. Description of the instrument.

Advantages of moderate amounts and disadvantages of high amounts of magnification, *e.g.*, in telescopic systems. Effects on brightness on observer's interpupillary distance, constriction of light pencils, and disturbances by vitreous and other opacities.

Technique of use. Table of corrections for ametropia.

MR. LINDSAY REA,

"The Use of Heparin in Thrombosis."

Heparin. Its discovery—its composition—its anti-coagulating activity—its use in blood transfusion—its use in surgery—leading to its use in ophthalmology.

Cases cited.

Suggested dosage and urgency.

During the Congress the usual trade exhibition was held and Messrs. Hamblin were so good as to organize a large exhibit of topical appliances for war-time measures.

ABSTRACTS

MISCELLANEOUS

(1) **Yudkin, Arthur M., and Geer, Harriet A. (New Haven, Conn.)—An investigation of experimental cataracts in the albino rat. Clinical implications.** *Arch. of Ophthal.*, January, 1940.

(1) **Yudkin** and **Geer's** albino rats consistently developed cataract when fed on a diet containing 35 per cent. of galactose. At the end of the fourth to seventh day slight engorgement of the ciliary vessels was present, then vacuoles, filled with fluid, developed beneath the lens capsule and at the end of 24—30 days fully developed cataract could be observed. During this period the animals maintained normal growth and health. When the amount of galactose was reduced to 25 per cent. lens opacities developed in only two-thirds of the rats, when reduced to 15 per cent., no definite ocular change was found. Raising the proportion of protein (casein) in the diet from 15 per cent. up to 35 per cent. delayed the onset of ocular changes by about two days. Decreasing the proportion of protein in the diet to 5 per cent., made the rats more susceptible to galactose and it was found that cataract developed when only 15 per cent. of this sugar was incorporated in the diet. Even when the proportion was reduced to 10 per cent. on a low protein diet,

cataracts developed in some of the rats. Cystine in large amounts (up to 4 per cent. of the diet) seemed to be efficacious in preventing the development of galactose cataract though it led to nutmeg changes in the liver with fatty infiltration. The effect of large amounts of riboflavin in preventing galactose cataract was negative. Administration of di-nitro phenol (without galactose) failed to produce cataract. Removal of galactose from the diet of 14 rats which had developed mature cataracts resulted in clearing of the edges of the lenses, with retention of nuclear opacity.

When commenting on the cause of galactose cataract, the authors quote Bellows and Rosner's observation that this sugar decreases the permeability of "the fresh beef lens" and so may interfere with its nutrition. The clinical applications of this work are not outstanding, but Yudkin's concluding sentence is worth quoting:—The patient with incipient cataract should be placed on "a well balanced diet, supplemented by vitamin B complex and lemon juice."

F. A. W-N.

(2) **Gifford, Sanford R., and Cushman, Beulah (Chicago).—Certain retinopathies due to changes in the lamina vitrea.** *Arch. of Ophthal.*, January, 1940.

(2) **Gifford** and **Cushman** remark that it is not generally known that closely packed aggregations of hyaline bodies in the macular region may cause more or less serious disturbance of vision in some middle aged and elderly people. That this is brought about by mechanical pressure on the rods and cones, resulting finally in their destruction, was shown by histological examination carried out by Treacher Collins. The shiny crystals found in some cases are due to deposits of calcium carbonate in the hyaline bodies. Clinically, the first symptom is metamorphopsia followed by the development of a central scotoma. In one case examined by Fuchs where characteristic colloid bodies were present without visual impairment, the pigment epithelium was found to be histologically intact over the hyaline deposits and the retina undamaged. The authors consider that "typical central disk-shaped retinopathy" (? synonymous with what is called central senile exudative retinitis) may have its origin in changes in the lamina vitrea. Several observers have examined such cases histologically and have found degenerative changes in Bruch's membrane such as thickening and the formation of fissures, with in some cases, vessels growing through them; rupture of these gives rise to haemorrhages in the central disc of connective tissue. The authors describe the histological examination of a case which ophthalmoscopically showed a greyish brown mass in the outer part of the macular area, and had a central scotoma. The mass consisted of thickened retina undergoing cystic degeneration and a layer of closely packed fibrillar spindle cells between

the retina and the lamina vitrea, much of which was formed by proliferation of the pigment epithelium. The lamina vitrea varied in thickness, being extremely thin in places and showing one defect through which passed a vessel lined only with epithelium. The authors consider that it is not always necessary for complete defects in the membrane to be present in order to produce "central disk-shaped retinopathy" and suggest that in some cases, an altered permeability is present which allows fluid from the chorio-capillaris to collect beneath the pigment epithelium bringing about its proliferation and the formation of a plaque. Cracks in Bruch's membrane may also cause the appearance of angioid streaks.

F. A. W-N.

(3) **Lucic, Hugo (Baltimore).—Sensitization of rabbits to uveal tissue by the synergic action of staphylotoxin.** *Arch. of Ophthal.*, September, 1939.

(3) Lucic's object in this work was :—

(1) To produce hypersensitiveness to uveal tissue in rabbits.

(2) To show that histologically the reaction was similar to that in man. And

(3) To compare the reactions occurring in the eyes of sensitised and non-sensitised animals after intra-ocular injection of uveal pigment.

Burky in 1933 discovered a staphylococcus which produced an exotoxin, lethal for rabbits. By repeated intra-cutaneous injections of the toxin, into a rabbit, active immunity was produced, but at the same time there developed hypersensitiveness to the broth in which the organism was grown. Other substances could be substituted for the broth with the production of hypersensitiveness to them. The author therefore used this method in sensitising rabbits to uveal tissue, and inoculated a mixture of this tissue and the staphylococcal toxin intra-cutaneously four times at weekly intervals. As a control, a second group of rabbits received inoculations of uveal tissues only, and a third group inoculations of uveal tissues and killed bacillus subtilis. At the end of the sensitising period, the animals were tested with injections of stock uveal pigment. Tissue from the injected area was removed two weeks later for histological examination. Of twenty-two rabbits receiving inoculations of bovine uveal pigment and staphylococcal toxin, six showed histological reactions characteristic of hypersensitivity. Of eleven animals which received inoculations of rabbit uveal tissue alone, none showed any reactions and the same was true of ten animals which received inoculations of uveal tissue and bacillus subtilis, and of ten which received bovine uveal tissue alone. Two of the rabbits which gave positive reactions were subsequently tested with simultaneous injections of rabbit, swine and autogenous

uveal pigment, and in both there was a uniformly positive reaction to all three injections, thus demonstrating the organ specific antigenicity of uveal pigment.

Intra-ocular injection of uveal pigment in three hypersensitive animals, combined in one of them with injury in the form of a ragged iridectomy in the fellow eye, failed to produce a histological picture greatly different from that observed in control animals similarly treated. The histological picture did not simulate that commonly observed in sympathetic ophthalmitis.

F. A. W-N.

(4) **Berg, F. (Upsala).—Corneal astigmatism and total astigmatism. (Hornhautastigmatismus und Totalastigmatismus).** *Acta Ophthal.*, Vol. XVII, p. 137, 1939.

(4) **Berg** finds that the curvature of the anterior corneal surface is not the exclusive factor in corneal astigmatism. In combination with the astigmatism induced by the posterior surface, astigmatism against the rule 0·1–0·2 D. results, and this does not account for the total astigmatism, which is largely lenticular in origin. The oblique incidence of the visual line in the horizontal meridian of the cornea is responsible for a variable amount of corneal astigmatism against the rule though not more than 0·01 D. in most cases.

ARNOLD SORSBY.

(5) **Bedell, Arthur J. (Albany, N.Y.).—Traumatic retinal angiopathy.** *Arch. of Ophthal.*, September, 1939.

(5) The first account of this relatively unknown condition was probably that given by Purtscher at Heidelburg in 1910. **Bedell** in this paper describes three cases. The first, a man aged 21 years, sustained fractures of the lumbar vertebrae as the result of a motor car accident: in the right eye, the entire posterior pole consisted of an immense milky white swelling which obscured the disc and covered the retinal vessels. There were many superficial haemorrhages. A similar condition was present in the left fundus. Three months after the accident there were still some remnants of the cloudy opacity and a few haemorrhages. The vision of the right eye had recovered to 6/6 however, but that of the left is not recorded because the eye was amblyopic. The second case had sustained a crushing injury of the chest and when seen, a few hours after the accident, was found to have several radiating cloud-like plaques near the discs. Retinal haemorrhages were found four days later. The right eye recovered 6/6 vision, but the left developed optic atrophy and did not see better than 6/30. The third case had an injury on the right side of the head and developed fluffy white exudates in the right retina, round the disc with haemorrhages, the

left eye being unaffected. Sixteen days after the injury the exudate was flatter but there were many fresh haemorrhages. The disc gradually became pale and vision nine months after the accident had gone down to 6/120. The condition of traumatic retinal angiopathy is diagnosed from commotio retinae by the unevenness of the swelling and the recurrent retinal haemorrhages in the former, and from blockage of the central retinal artery by the same features. The cause of the condition is unknown, but it appears possible that the cloudiness develops in the posterior layers of the vitreous rather than in the anterior layers of the retina since there is no evident relation between the amount of exudate and the visual end result.

F. A. W-N.

BOOK NOTICES

Hydrophthalmia or Congenital Glaucoma. By J. RINGLAND ANDERSON. Pp. 377, 116 Illustrations. Cambridge University Press. 1939. Price, 25/-.

As Sir John Parsons says in his foreword, this volume is a much more extensive treatise than its forerunner published in 1897 by Dr. Edmund le Gros, and will long remain authoritative. No better raison d'être could be given for its appearance than the opening sentences of the introduction which give an account of a conversation between an ophthalmic surgeon and the father of a child who is blind from congenital glaucoma. The material of the book is derived from an exhaustive survey of the literature, from personal experiences of the author, and from the results of a questionnaire sent to oculists in many different countries. The author justifies his use of the term hydrophthalmia in preference to buphthalmia by saying that the phrase "eye of the bull" does not suggest the failing vision or the raised tension which are essential features of the condition.

The eight chapters into which the book is divided deal successively with general aetiology; differential diagnosis; structure, development and comparative anatomy of the involved tissues; pathology; pathogenesis; treatment; prognosis and finally general reflections. At the end of the book are three comprehensive tables of analyses of specimens of the disease and at the end of each chapter is a short summary of its contents.

It is not possible in a short review to do justice to the many admirable features of this book. To the practising ophthalmic surgeon, the chapter of greatest interest will probably be that which is devoted to treatment. Many and various are the operations performed, and although trephining is in most general use, Herbert's

sclerotomy has at least one strong advocate and in the author's opinion, much is to be hoped from Barkan's goniotomy. Whatever the operation, any hope for success almost vanishes if its performance is delayed beyond the first year.

The pathogenesis of hydrophthalmia is an interesting field for speculation. It is led up to by a comprehensive study of the development and comparative anatomy of the angle of the anterior chamber. As a result of this, the author concludes that in 86 per cent. of early specimens, the cause of the disease is probably a persistence of the foetal state or the abnormal development of a meshwork of tissue in the angle, preventing the normal drainage of aqueous. Inflammatory phenomena may come in however, and in some cases, a sort of hen and egg discussion ensues as to whether the inflammation caused the hydrophthalmia or the hydrophthalmia the inflammation. Support for the developmental theory is obtained from the association of hydrophthalmia with other anomalies such as facial neurofibromatosis, facial naevi and foetal state of the ciliary muscle.

Although no single ophthalmic surgeon is likely to see many cases of this disease during his professional life, he cannot help being interested in this book. Its perusal will give him a wider interest in his speciality and perhaps lead him to speculate on some of its philosophical aspects. In a sense, it demonstrates the value of ophthalmology for ophthalmology's sake, rather than its value as say a handicraft, or as a means of increasing the industrial or destructive efficiency of the human race. It is a good thing occasionally to stop and think, and this, Ringland Anderson causes us to do with his really remarkable treatise.

Pathologisch-anatomische Untersuchungen über die Beziehungen der Gefassklerose des Auges zu arterio-sklerotischen veranderungen im Gehirn, im Herzen, in der Nieren und an den grossen Korperarterien. By F. RINTELEN. Sixty-four pages. Basle: S. Karger. 1939. Price, Swiss Franc 5·60. (Supplement XXIX of *Zeitschr. f. Augenheilk.*)

This is a careful clinical and post-mortem study of 45 cases distributed over the following affections: senility, generalised arteriosclerosis without hypertension, hypertension in contracted kidney, arteriosclerosis with hypertension, vascular syphilis and miscellaneous vascular abnormalities. Eleven of these patients showed a coincident diabetes. On the basis of this material Rintelen concludes that in most cases the retinal vessels showed more gross lesions than those of the choroid. Heavy involvement of the smaller cerebral vessels were rare though the basal arteries of the brain showed severe atheromatous lesions. The smaller vessels of the brain are thus not involved to the same extent as the retinal vessels and even the basal vessels may be completely free

from sclerotic changes in advanced retinal arteriosclerosis. The reverse was also found to be true. He could establish no relationship between atheromatous lesions in the larger vessels of the body and sclerosis of the retinal and renal arteries, but there was a close parallelism between changes in the vessels of the retina and those of the kidney. "The retina is a mirror not of the brain but of the kidney." The monograph also contains details on the histological changes in the retinal vessels and the distribution of vascular changes over the different parts of the eye.

Die pathologische Histologie der Tränendruse. By MAGDA RADNÓT. Sixty-four pages. Basle: S. Karger. 1939. Price Swiss Franc 7·80. (Supplement XXVIII of *Zeitschr. f. Augenheilk*).

Radnót's monograph fills a gap in the literature on the morbid histology of the lacrimal gland. Neither the periodical literature, nor the systematic text-books deal exhaustively with the subject and the author's contribution is not only a review of the sparse literature, but a critical account of 500 specimens personally studied. The result is a useful contribution containing a mass of histological detail and a clear account of such ill-known appearances as changes in epithelial cells, the development of round cell infiltration, the presence of plasma cells and of onkocysts in the gland. The appearances in the lacrimal gland seen in such general affections as lymphogranulomatosis, leukaemia and kerato-conjunctivitis sicca amongst other general affections are discussed in detail.

Proceedings of the All-India Ophthalmological Society. Vol. VI. 1938.

The proceedings of the All-India Ophthalmological Society forms an octavo volume of 243 pages. We note that there are 149 members.

There is the report on a symposium on uveitis at which the principal speakers were Dr. Srinivasan, Sir J. N. Duggan, Dr. Ratoraker, Dr. Kaul and Dr. Refatullah. The rest of the volume is devoted to short case reports and papers. Bhaduri reports a case of Beal's follicular conjunctivitis; there are papers on trachoma and epidemic dropsy glaucoma, among which is one on treatment by Lieut.-Col. Kirwan, who also contributes a short account of new intra-capsular extraction forceps.

There are also papers on presbyopia in India and on the incidence of errors of refraction seen at Lahore with a programme for "eye-sight preservation day" in schools. Prontosil in ophthalmology and sulphanilamide in trachoma are also included as are the abuse of perimetry, cases of Eales' disease and a paper on the surgical treatment on retinal detachment.

It is obvious that the Society is doing very good work and the volume as a whole is full of interest and of definite value.

NOTES

White Oak Hospital, Swanley

DURING 1939 there were 369 new admissions to the hospital, as against 478 in 1938—an indirect testimony to the usefulness of the hospital if the great dislocation from evacuation of children from London and the closing down of the schools in September is taken into account.

The following table gives the distribution according to affection:

Blepharitis	203
Phlyctenular ophthalmia	104
Interstitial keratitis	14
Squint	12
Corneal ulcer	7
Trachoma	5
Conjunctivitis	5
Spring catarrh	3
Iridocyclitis	3
Recurrent styes	2
Hypopyon ulcer	2
Keratitis of unknown origin	2
Other conditions	7
	369

On September 1 the work of St. Margaret's Hospital was transferred to White Oak Hospital. This has involved admitting 40 babies with ophthalmia neonatorum and 25 mothers, raising the total of admission to the hospital to 434. These patients have been housed in the old infirmary block and there is no contact with the rest of the hospital.

The work of the hospital is proceeding normally. A specially gratifying feature is the steady decline in the number of children with trachoma. At the outbreak of the war the number had already declined to 19; by the end of the year it was 14. (At the time of writing this note—March, 1940—the number had become reduced to 6.)

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The Montgomery Lecture. 1941

THE Council of the Royal College of Surgeons in Ireland has invited Mr. Arnold Sorsby to deliver the Montgomery Lecture in May, 1941. It will be given on the day of the Annual Meeting of the Irish Ophthalmological Society in Dublin

FUTURE ARRANGEMENTS

July 4-6, 1940.—Ophthalmological Congress, at Oxford.